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ABSTRACT

A survey to elicit data on R&D expenditures of state government agencies for fiscal years 1972 and 1973 is covered in this document. In 1973 total R&D expenditures by all sectors of the economy were $30,427 million. The R&D expenditures of state government agencies amounted to 0.9 percent of this total. Expenditures of state government agencies to applied research amounted to 2.4 percent of the national effort in 1973. This document requested expenditure data by state agency subdivision in terms of character of work (basic research, applied research, and development), source of funds, performer, field of science, and R&D activities. The survey questionnaire included agencies responding to the previous state government R&D grants and contracts. Sections are: (1) the state and science; (2) broad features of state R&D support; (3) leading supporting states; and (4) R&D manpower. Appendixes contain: (1) technical notes; (2) statistical tables; (3) R&D activities in state universities and colleges; (4) reproduction of survey questionnaires; and (5) selected bibliography. (Author/KE)

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Fiscal Years 1972 and 1973

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FOREWORD

This report is the third in a series presenting the results of surveys conducted by the National Science Foundation on R&D activities of State government agencies. The first year to be surveyed was 1964, and the latest year, 1973, so that a period of almost 10 years becomes available for trend analysis. In that time most State governments have undergone a reorganization process that has increased their ability to respond to public issues. This process has included a growing recognition of the role of science, and thus the findings of this latest survey may provide useful and timely background.

The report was prepared in the NSF Division of Science Resources Studies. General guidance for the study was provided by William Stewart, Head, R&D Economic Studies Section. Data collection and tabulations were carried out by the Bureau of the Census under the direction of Kenneth Anderson, Acting Chief, Governments Division.

The National Science Foundation and the Bureau of the Census appreciate the help of the many staff members in State agencies who provided the data upon which this report is based.

Charles E. Falk
Director, Division of Science
Resources Studies

February 1975

acknowledgments

This report was prepared in the Division of Science Resources Studies under the direction of Benjamin Olsen, Study Director, Government Studies Group. Responsibility for review of responses and coordination with the Bureau of the Census was taken by Charles Gainor. Responsibility for organizing and writing the report was taken by Eleanor Stoddard, assisted by Howard Cihak. Dorothy Ham prepared the statistical and graphic material.

The Bureau of the Census collection and tabulating operations were carried out by Joel Miller, assisted by John Curry, under the supervision of William Fanning.

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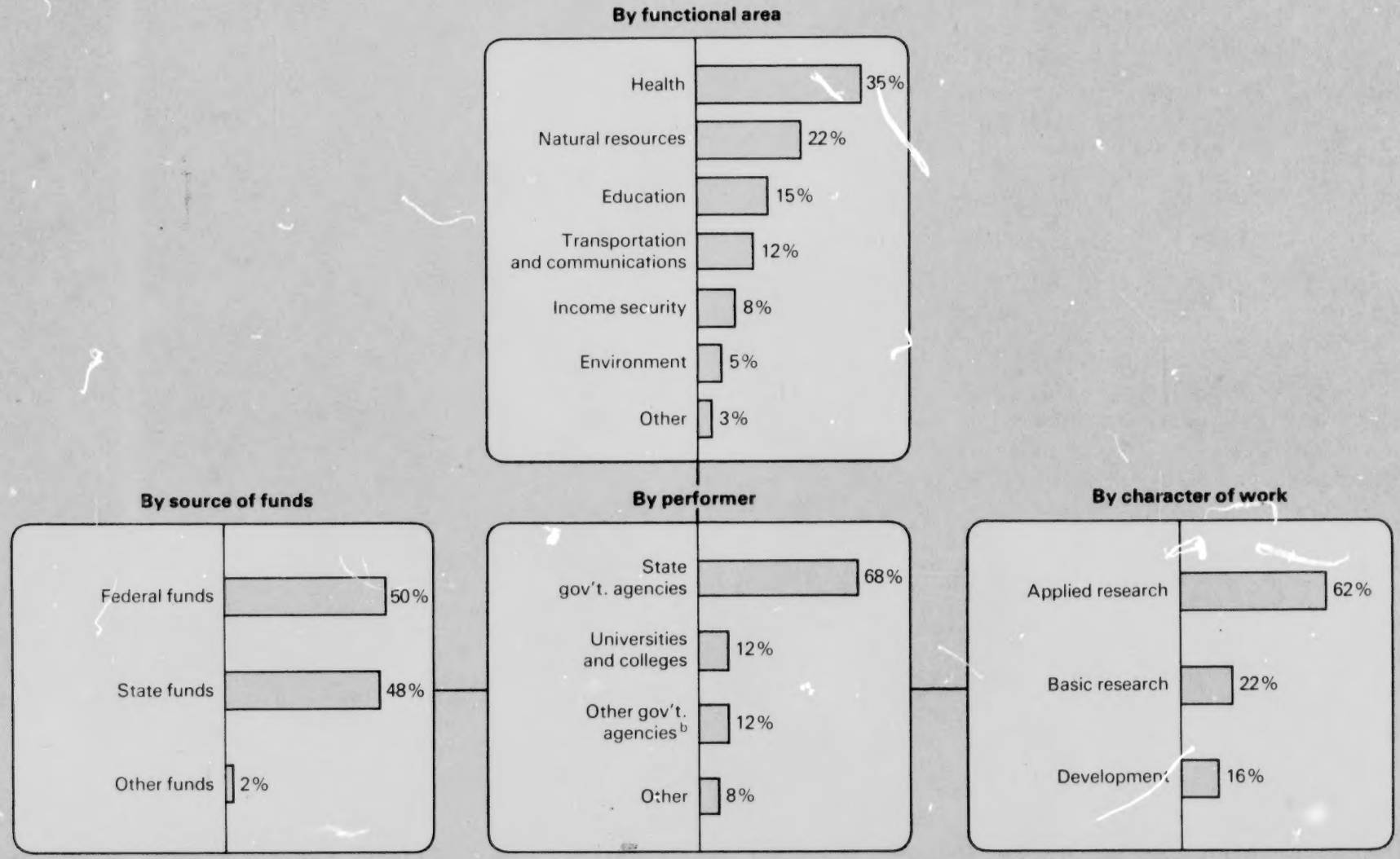
Distribution of State government agency expenditures for research and development[a], FY 1973

$264 million



[a] R&D plant excluded.

[b] Federal, local, and multigovernmental agencies.

SOURCE: National Science Foundation

HIGHLIGHTS

- Expenditures of State government agencies for research and development totaled $235 million in fiscal year 1972 and $264 million in fiscal year 1973. An additional $7.2 million was spent in fiscal year 1972 and $9.6 million in fiscal year 1973 for R&D plant. From 1964 to 1973 State agency R&D and R&D plant expenditures increased almost fourfold, and even in constant dollars, the rise was almost threefold.
- In 1973 New York accounted for 23 percent and California for 13 percent of total State R&D expenditures. The next 13 States in such expenditures were, in descending order, Illinois, Florida, Texas, Washington, Pennsylvania, Virginia, Michigan, Indiana, Ohio, New Jersey, Massachusetts, North Carolina, and Colorado. Collectively, the first 15 States accounted for almost three-fourths of total State R&D expenditures.
- The first 15 States in R&D and R&D plant expenditures in 1973 included 13 that were among the first 15 States in population and total personal income. The first 15 States in R&D and R&D plant expenditures also included 11 that were among the first 15 States in State government general expenditures.
- State agency R&D expenditures were chiefly directed toward health and natural resources, which made up 35 percent and 22 percent, respectively, of the R&D total in 1973. Next in amount of support were education, 15 percent; transportation and communications, 12 percent; income security and social services, 8 percent; and environment, 5 percent.
- In both 1972 and 1973 the Federal Government provided slightly more than 50 percent of the funds expended by State government agencies for R&D programs and the States provided approximately 48 percent. The remaining 2 percent was provided by nongovernment sources, such as foundations and private industry.
- Applied research accounted for 62 percent of the total R&D effort of State government agencies in 1973; basic research accounted for 22 percent, and development for 16 percent.
- State government agencies perform the largest share of their R&D work intramurally, with State personnel. In 1973 intramural performance accounted for 68 percent of the total State agency R&D effort. Universities and colleges accounted for 12 percent, and other performers, such as private industry, nonprofit institutions, and local governments, for 20 percent.
- The biological and clinical medical sciences accounted for 46 percent of total R&D funds expended in 1973, mostly reflecting work within the health and natural resources functions. The social sciences made up 25 percent of the total, reflecting education programs. Engineering represented 12 percent.
- State agencies employed approximately 11,500 full-time-equivalent (FTE) personnel in 1973 in the performance and support of R&D activities. Scientists and engineers made up 43 percent of the total, while technicians and administrative support personnel made up 29 percent each.

INTRODUCTION

In the past decade three surveys have been undertaken by the National Science Foundation (NSF) to elicit data on R&D expenditures of State government agencies. Even though the amounts involved were known to be relatively small, the surveys were conducted to provide a data base for measurement of a growing area of R&D activity, one that is of increasing interest to those concerned with the utilization of R&D results. The earlier State agency surveys covered fiscal years 1964, 1965, 1967, and 1968, and the survey that formed the basis for this report covered fiscal years 1972 and 1973.

In 1973 total R&D expenditures by all sectors of the economy were $30,427 million. The R&D expenditures of State government agencies amounted to 0.9 percent of this total. Since most of the effort of these State agencies was applied research, a more significant ratio might be found by comparing their applied research total with the national applied research total. In this kind of activity the State government agency effort equaled 2.4 percent of the national effort in 1973.

A more comprehensive view of State R&D expenditures in the public sector can be attained by including the R&D expenditures of State universities and colleges, which are considerably larger than those of State agencies. When these were added to State government agency R&D expenditures for 1973, the combined total amounted to $1,990 million, or 6.5 percent of all national R&D expenditures. The State government agency survey omitted R&D expenditures of State universities and colleges since these are covered in another recurring NSF survey involving all universities and colleges in the United States. To give a full view of State public R&D expenditures, appendix C of this report provides tables showing the R&D expenditures of State universities and colleges in 1973.

The current survey for fiscal years 1972 and 1973 requested expenditure data by State agency and agency subdivision in terms of character of work (basic research, applied research, and development), source of funds, performer, field of science, and R&D plant. It also requested data on manpower engaged in State agency intramural R&D activities. The same categories, definitions, and general guidelines were used as were used in the earlier surveys.

NSF staff assigned R&D programs to functional areas on the basis of program descriptions and other information furnished by the agencies. In this report, however, the list of functional categories was revised from earlier State R&D expenditure reports to conform to the classification system used by NSF in its annual reports on Federal R&D funding by function.[1] In the historical tables in appendix B of this report, earlier data by functions have been reconstructed to conform with the function classification system used for this latest survey.

The survey questionnaire (appendix D) was developed by NSF. The State agency universe included agencies responding to the previous State government R&D surveys, State agencies queried in the Bureau of the Census annual employment survey, and State agencies listed by Federal agencies as receiving R&D grants and contracts. The initial universe of 1,309 State agencies was reduced to 1,276 in the course of the survey as a result of agency terminations and consolidations. A response rate of approximately 98 percent was obtained. Of the agencies responding, 519, or 40.7 percent, reported research or development work.

The data have their most notable limitation in the area of interpretation of R&D definitions. Responding agency staff members sometimes had difficulty in determining which programs could be considered to be of an R&D character. The more rapid growth shown for R&D programs between 1964 and 1968, compared with 1968 to 1973, may have been to some extent the result of underreporting in the first survey. As more surveys are conducted in the future, State agencies will undoubtedly refine their reporting procedures further, and more precise analysis of State R&D activities will be attainable. The data, even in their present stage of development, offer a reasonably reliable view of the role of State governments in the national R&D effort.

[1] See National Science Foundation, *An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1975* (NSF 74-313), (Washington, D.C., 20402: Supt. of Documents, U.S. Government Printing Office, 1974)

Section 1. THE STATES AND SCIENCE

Factors in State R&D Support

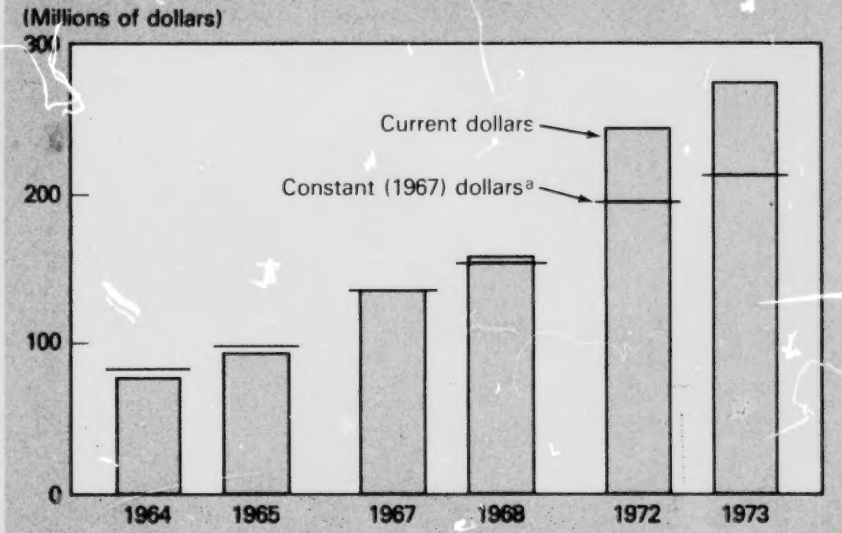
Expenditures for research, development, and R&D plant by State government agencies rose from $242 million in fiscal year 1972 to $273 million in fiscal year 1973. The expenditures reported in 1973 represent an almost fourfold increase over the $77 million reported in 1964,[1] and even in constant dollars the rise is almost threefold.

Despite this growth trend, R&D programs on the State level are not yet established on a widespread basis as an instrument of State agency operations and State planning and policy. Some States have supported science as a means to economic growth, and State R&D efforts have shown consistency in certain areas. But during the whole 1964-73 period the R&D and R&D plant share of State government general expenditures remained at less than one-half of 1 percent in the aggregate, and only a handful of States even approached the 1-percent level.

State governments for the most part are just beginning to develop policies for the use of science. While State agencies have supported R&D programs to a limited extent and a few governors and legislatures have called upon technical competence from time to time, the State organization has not been geared to take real advantage of scientific and technological advances. Recent trends, however, have created a climate in which State use of science and technology is bound to be intensified. The cost/revenue squeeze is putting pressure on State governments to employ the most cost-effective programs, and the impact of technology on the environment and the rising expectations of citizens are forcing the adoption of more objective methods of decision-making than heretofore. The increasing number of bills with technology aspects passed by State legislatures since 1968[2] is concrete evidence that science is entering the State political process in a basic way.

At the executive level all the States now have science advisors or advisory panels, although these tend to operate at a distance and are not systemmatically called on. A more direct sign of gubernatorial engagement with science was the Governors' Energy Project initiated by the National Governors' Conference in mid-1973. This project, which is still continuing, has brought about a strong commitment by States to research in the energy field.

State agency R&D and R&D plant expenditures, selected years



[a] Based on GNP implicit price deflator.
SOURCE: National Science Foundation

[1] The present NSF survey is the third to gather data on R&D expenditures of State government agencies exclusive of State universities and colleges. The earlier surveys covered fiscal years 1964, 1965, 1967, and 1968.

[2] The Council of State Governments, *Power to the States: Mobilizing Public Technology* (Lexington, Ky, 1972).

State Agency R&D expenditures[1] by State and functional area, fiscal year 1973

[Dollars in thousands]

States	Total	Health	Natural resources	Education	Transportation & communications	Income security & social services	Environment	Crime prevention & control	Economic growth & productivity	All other
Total, all States	$263,778	$92,042	$59,103	$39,954	$31,198	$20,202	$12,198	$4,564	$1,753	$2,764
New York	60,330	50,624	3,266	987	2,271	471	1,518	377	145	672
California	35,375	12,350	7,976	6,810	4,132	149	2,165	1,466	50	278
Illinois	12,259	4,281	2,332	1,565	1,123	584	1,735	572	68	.....
Florida	11,145	4,476	2,458	664	1,565	1,667	20	.....	294	.....
Texas	10,704	1,015	2,790	3,759	2,277	404	288	172	.....	.....
Washington	10,635	183	3,200	458	1,403	4,703	456	.....	229	3
Pennsylvania	9,243	3,424	614	1,350	2,522	628	569	25	.....	110
Virginia	6,856	425	3,556	1,275	1,419	7	.....	.....	174	.....
Michigan	6,829	2,501	1,535	813	1,391	589	.....	.....	.....	.....
Indiana	5,874	625	286	277	635	4,050	.....	.....	.....	.....
Ohio	5,870	736	980	2,785	1,034	325	.....	.....	10	.....
New Jersey	5,596	761	232	627	2,237	157	1,082	.....	.....	500
Massachusetts	5,279	1,763	728	694	460	.....	1,276	359	.....	.....
North Carolina	5,262	695	2,836	1,240	243	.....	.....	.....	.....	247
Colorado	5,224	374	1,473	451	40	2,787	.....	100	.....	.....
Alaska	4,072	30	3,768	80	193	.....	.....	.....	.....	.....
Kentucky	3,925	122	856	697	900	597	352	.....	401	.....
Oregon	3,507	.....	1,252	1,867	156	.....	538	.....	58	36
Wisconsin	3,788	464	1,177	209	297	1,034	357	250	.....	.....
Georgia	3,300	739	554	1,678	274	55	.....	.....	.....	.....
Tennessee	3,199	1,052	913	1,126	83	.....	24	.....	.....	.....
Arizona	3,183	154	645	.....	2,146	102	35	100	.....	.....
Maryland	3,165	1,154	606	365	242	8	105	13	.....	673
Connecticut	3,032	1,105	1,485	.....	434	8	.....	.....	.....	.....
Minnesota	2,849	118	332	1,976	296	32	.....	55	.....	40
Hawaii	2,371	48	984	828	73	215	105	.....	119	.....
Oklahoma	2,277	517	957	248	280	.....	144	131	.....	.....
West Virginia	2,207	194	864	827	119	28	28	149	.....	.....
Louisiana	2,046	302	862	10	743	.....	124	.....	.....	.....
Maine	2,006	23	1,386	196	135	9	254	3	.....	.....
South Carolina	1,994	106	904	713	.....	91	.....	139	28	11
Missouri	1,865	50	954	458	232	.....	86	.....	.....	84
Iowa	1,679	316	537	546	146	67	.....	7	37	24
Kansas	1,639	155	132	495	384	327	103	44	.....	.....
Utah	1,636	276	170	1,097	55	.....	5	32	.....	.....
Alabama	1,359	131	180	774	151	12	111	.....	.....	.....
South Dakota	1,308	.....	261	573	64	.....	395	.....	15	.....
Idaho	1,271	.....	1,230	.....	23	.....	7	.....	11	.....
Arkansas	1,204	.....	166	438	154	250	.....	174	3	18
Mississippi	1,190	45	25	559	305	25	63	168	.....	.....
Vermont	1,169	123	149	.....	6	797	7	87	.....	.....
Wyoming	991	373	481	23	91	.....	.....	8	15	.....
Nevada	934	51	775	.....	21	24	.....	.....	.....	63
Montana	930	35	620	30	46	.....	119	80	.....	.....
New Mexico	825	.....	715	.....	60	.....	49	.....	.....	.....
North Dakota	818	120	205	286	137	.....	4	.....	66	.....
Nebraska	452	.....	221	.....	138	.....	.....	56	31	6
Rhode Island	292	5	201	.....	53	.....	33	.....	.....	.....
Delaware	269	.....	169	100	.....	.....	.....	.....	.....	.....
New Hampshire	150	.....	107	.....	.....	.....	42	.....	.....	.....

[1] Excludes R&D plant.

[2] Area and community development and housing, science and technology, and energy development and conversion.

Note: Detail may not add to total because of rounding.

Some State legislatures have moved toward arrangements for incorporating scientific thinking into the decisionmaking process. In 1971 the New York State Assembly created a scientific staff that is the first full-time unit of its kind to provide scientific information to standing committees of the Assembly. The California Assembly now has a Science and Technology Advisory Council, and Massachusetts has a Legislative Scientific Staff within the Joint Rules Committee.

In nine States science foundations, or their equivalent, have been established between 1964 and the present time, largely as a means of stimulating economic growth.[3] These organizations are, of course, State agencies but differ from the others in their use of science in that they provide support to science and technology to enhance State research capabilities and to meet broad economic and social needs. Foundation expenditures have been directed either into support for higher education to attract R&D brainpower which, in turn, would attract growth industries, or into support for applied research projects performed by industry and nonprofit institutions in public goods areas. Such projects, it was hoped, would aid the development of new technologies, and State agencies and their clients would help provide the markets for them.[4]

A total of 22 State-initiated nonprofit centers of innovation have also been organized to attack specific problems or to support major fields of science. Fifteen of these are in Pennsylvania, four in North Carolina, one in New York, and one in Louisiana (one in Kansas has been discontinued.)[5] As an aid to technology transfer North Carolina has additionally established a Science and Technology Research Center, jointly funded by the State and the National Aeronautics and Space Administration. The center makes available computer-searchable indexes and abstracts in fields such as space sciences, engineering, chemistry, textiles, biology, food, and medicine.

[3] These include the Connecticut Research Commission, the Connecticut Product Development Corporation, the Research Foundation of Kansas, the Kentucky Science and Technology Center, the Louisiana State Science Foundation, the Massachusetts Science and Technology Foundation, the North Carolina Board of Science and Technology, the New York State Science and Technology Foundation, and the Pennsylvania Science and Engineering Foundation. The foundations in Connecticut, Kansas, and Kentucky are currently not funded. See D. D. Colosimo, Marcia Wilkof, and Jules J. Duga, *The State Development Foundation: Meeting Societal Needs Through Centers of Innovation*, Ohio Department of Economic and Community Development (Columbus, Ohio, March 1974). In 1974 a foundation was also established in Ohio.

[4] Wesley H. Long and Irwin Feller, "State Support of Research and Development: An Uncertain Path to Economic Growth," *Land Economics, 48:3 (Aug. 1972)*.

[5] Colosimo, Wilkof, and Duga, op cit.

Patterns of State Agency R&D Expenditures

R&D support by other State agencies has been motivated differently from that for foundations. Most agency science programs have been in the form of applied research directed to the solution of fairly immediate problems that arise in program administration. State legislation involving science and technology tends to be regulatory in nature (strip mining, wetlands, illegal drugs, atomic power generation, refuse disposal, etc.), and R&D work may be required on the part of State agencies to carry out the requirements of the law. Often State R&D efforts have been conducted to address pressing State problems that were local versions of nationally defined problems. In any event, R&D funds have tended to be limited at the State agency level, and personnel trained to administer or perform research and development have tended to be lacking. For many years a view has prevailed that the Federal Government should have the research responsibility for national domestic problems and the States should confine themselves to problems "unique" to their jurisdiction.[6] As a result of all these factors, the size of State agency R&D activities when compared with Federal R&D activities is miniscule—approximately 1½ percent of the Federal R&D total in 1973.

With such relatively small amounts to consider, few State budget offices have established a regular mechanism for isolating R&D programs and analyzing them as a budget component, as is done in the case of the Federal budget. Often State agencies reporting for the NSF survey were not aware that some of their programs were of an R&D nature until they examined them with R&D definitions in mind. Some programs were, of course, readily identifiable, as in the case of highway research and planning that is a condition of Federal highway grants. In many other cases, however, the identification of an R&D program was a matter of judgement: how to isolate R&D activities, as such, as distinct from operational activities, or distinct from data collection for general purposes.

Despite these limitations, evidence has emerged from three separate NSF efforts to gather data on State government agency R&D

[6] Irwin Feller, Alfred J. Engel, and Robert S. Friedman, with Donald C. Menzel, Jr. and John F. Sacco, *Intergovernmental Relations in the Administration and Performance of Research on Air Pollution* (University Park, Pa: Center for the Study of Science Policy, Institute for Research on Human Resources, The Pennsylvania State University: 1973.)

programs that these programs are growing in number and in size.[7] Besides the need for research in traditional areas like health and natural resources, the rise of new areas of social concern, like the environment and drug abuse, have called for extensive gathering of data, for testing, and for evaluation as the basis for making decisions in the public interest. Energy, now a leading area of State concern, will increasingly reflect R&D expenditures, although the period covered by the 1972-73 survey just predated the rise of State R&D activities in this field. In fact, only four States reported any R&D support under energy in 1973.

State R&D expenditure data reveal many imbalances, as might be expected in such a newly emerging area representing 50 separate political entities. Of the 1973 total of $264 million in R&D expenditures exclusive of R&D plant, approximately three-fourths was accounted for by 15 States. One State alone, New York, accounted for almost one-fourth of the total. On an activity level, the health function represented 35 percent of total State R&D expenditures in 1973, followed by natural resources with 22 percent. Education took up another 15 percent that year, and transportation and communications, a further 12 percent. Thus, 84 percent of State R&D program activities was concentrated in four functions out of the 11 functions that encompassed the whole range of programs.

On a nationwide basis a few States often determined the leading position of certain functions. In the case of health, the funds expended by New York and California alone established the leadership of this function in 1973 in State R&D expenditures. In the case of natural resources, funding was more dispersed. For education, however, California's R&D support was significant in placing this function in third place among all State-supported functions. Transportation and communications also showed fairly widespread R&D activity, but for the next function in overall State support—income security and social services—Washington, Indiana, and Colorado contributed almost three-fifths of the R&D funding.

[7] The scope of the State agency survey precluded data on R&D activities at State universities and colleges other than those carried out under grants or contracts from the State agencies themselves. These other activities are covered in another recurring NSF survey, and a brief description of them is found in appendix C of this report. The total State R&D effort in 1973 was $1,990 million, of which the State agency total was $264 million. The remaining $1,726 million performed at State universities and colleges (which does not include $28 million performed for State agencies) should be taken into consideration in any complete analysis of public R&D expenditures within the States. A forthcoming NSF report discusses total State R&D efforts.

Distribution by source of funds displayed considerable variation from State to State. Some of the States provided their own funding for most of their R&D efforts, but most supported the major share of their R&D activities with Federal grants. In 1973 only 13 States provided directly 50 percent or more of the funds for their own R&D expenditures, while 37 States obtained more than 50 percent of their R&D funds from the Federal Government. Among the leading 15 States, six furnished 50 percent or more of the total R&D support funds. The higher incidence of direct State support among these leading States can be related to larger budgets, and hence greater capacity to assume the risk inherent in R&D efforts.

Some functional areas showed considerable consistency in funding patterns. In education, transportation and communications, and income security and social services, most States relied primarily on Federal funds for the conduct of R&D programs. But in health, natural resources, and environment, inconsistency was shown. For work within these functions, some States relied mostly on Federal funds and other States relied mostly on State appropriations with an almost even distribution of chief reliance on one source or the other between States reporting activities.

Influence of Federal Aid

Federal agency programs have had an influence on the conduct of research and development by State agencies, but the survey did not elicit information on the process by which State agencies elected to turn to Federal support for given programs. State agencies have often been encouraged to enter into R&D efforts as part of their participation in Federal grants-in-aid, although the incidence of federally supported R&D activity has varied widely. In 1964, the first year State R&D expenditures were surveyed, total Federal aid to State governments amounted to $8.9 billion, with virtually all of the aid in the form of categorical grants. By 1973 Federal aid to State governments totaled $30.6 billion,[8] mostly in the form of categorical grant programs which had considerably increased in number by that time and many of which were narrowly defined and restrictive in their requirements. Some Federal grants had R&D components, and in certain cases research ac-

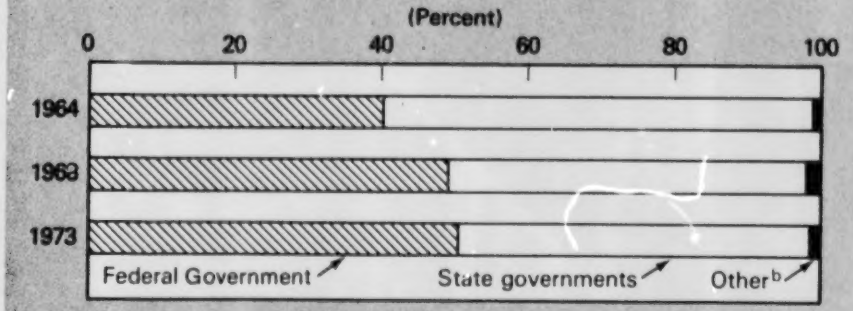
[8] Department of Commerce, Bureau of the Census, *Governmental Finances in 1963-64; Governmental Finances in 1972-73* (Series GF 73-No. 5) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1974.)

tivities were required on the part of recipient State agencies. This requirement was so infrequent, however, that the amount of Federal aid used for R&D purposes was a small fraction of that used for all other State purposes.

From the point of view of the States, the proliferation of Federal grants in the 1963-73 decade meant that funds were available for programs in a number of areas and that these funds could be employed for research and development as well as other purposes. States skilled in seeking Federal aid amid the variety and duplication of Federal agency programs received more grant support than others. Some State agencies were more adept than others at finding Federal sources of funds and meeting Federal requirements in obtaining them. For all these reasons the distribution of the federally supported programs reported by State agencies in the NSF 1972 and 1973 survey, and earlier surveys, is extremely uneven. What the surveys did show was that in 1973 slightly more than 50 percent of all State R&D expenditures was funded by Federal agencies, compared with 40 percent in 1964.[9] State appropriations provided almost all the rest of the funds.

[9] One feature of State R&D expenditures is the greater extent to which they are federally underwritten in comparison with overall State expenditures. In 1964 Federal aid as a share of *all* State expenditures was 20.9 percent; in 1973 it was 25.7 percent. See Department of Commerce, Bureau of the Census, *Governmental Finances in 1963-64*; *Governmental Finances in 1972-73*, *op. cit.*

State agency R&D expenditures[a], by source of funds, FY 1964, 1968, and 1973



[a]R&D plant excluded.
[b]Foundations, business firms, and other nongovernmental sources.
SOURCE: National Science Foundation

By the late sixties a move away from the rigidity of Federal categorical grants was made through the introduction of block grants, which established much broader program categories. The Public Health Amendments of 1967 and the Crime Control Act of 1968 embodied such changes. These acts required States to file plans in conformance with Federal regulations but gave them considerable freedom to shape programs.[10] The trend was carried further with the introduction of General Revenue Sharing in 1972. Bills were additionally proposed in the Congress to replace narrow categorical grant programs with Federal aid that could be more flexibly administered in broad areas like urban community development, education, law enforcement and criminal justice, and manpower training.

By the end of 1974 several of these acts had been passed.[11] The effect of these liberalized Federal grants procedures on future State agency R&D efforts is a matter of conjecture.

Federal Policy Toward State Science Activities

The Council of State Governments has stated that a clear need exists for the States to develop greater capacity for the use of public technology and for the assessment of technological impacts.[12] Among other things, the States need to exchange their experience, to work more closely with Federal agencies, to develop mechanisms for fuller use of State universities, and to form aggregate markets among themselves for the use of more sophisticated technology. They need to define areas for R&D input.

Because most States have undergone reorganization since the mid-sixties and because public thinking in regard to their role has changed, most are now in the process of assuming greater initiative and control in program planning and implementation. As part of this process, the National Science Foundation has been working to help the States find ways to improve their ability to use science and technology. The

[10] Daniel J. Elazar, *American Federalism: A View from the States*, (New York: Thomas Y. Crowell Co., 1972) p. 77.

[11] The Comprehensive Employment and Training Act of 1973 (P.L. 93-203); the Education Amendments Act of 1974 (P.L. 93-380); and the Housing and Community Development Act of 1974 (P.L. 93-383). The National Mass Transportation Assistance Act of 1974 (P.L. 93-503) was also made into law late in 1974, allowing States and localities to allocate funds among highway or mass transit operating programs on the basis of their own priorities.

[12] Council of State Governments, *op. cit.*

RANN (Research Applied to National Needs) program, established in 1970, required utilization planning for RANN research projects. The NSF Office of Intergovernmental Science and Research Utilization (ISRU) was made a link between RANN output and State usage.

ISRU is charged with the dual task of fostering new institutions and mechanisms in State governments for the application of science and technology and of promoting the specific use of RANN research on the part of State government bodies. ISRU has made a number of grants to State groups at the executive, legislative, and State university levels to help establish means of incorporating scientific competence on a continuing basis into State government operations. ISRU has been encouraging States and cities to put into practice technology transfer techniques, such as those employed by the Agricultural Extension Service. Since 1973 a program has been operating to distribute RANN and other research findings to State and local governments through a new corporation, Public Technology, Inc.; current emphasis is on energy and land use. These are just some of the efforts undertaken by ISRU, and other agencies such as the National Aeronautics and Space Administration, to encourage research utilization on the part of State governments.

The recent energy response of the National Governors' Conference is evidence of rising State awareness of the need to use science and technology to solve public problems. Not only does the NGC Energy Project identify problems and draw upon Federal energy research, but it has also already been instrumental in encouraging considerable research at the State agency level. On the legislative level a conference of legislative leaders from northeastern States was held in 1974 to develop an effective joint Federal/State response to the energy crisis. ISRU gave support to this conference. An evolution of further State efforts along these lines in other areas—such as land use and resources—can be expected.

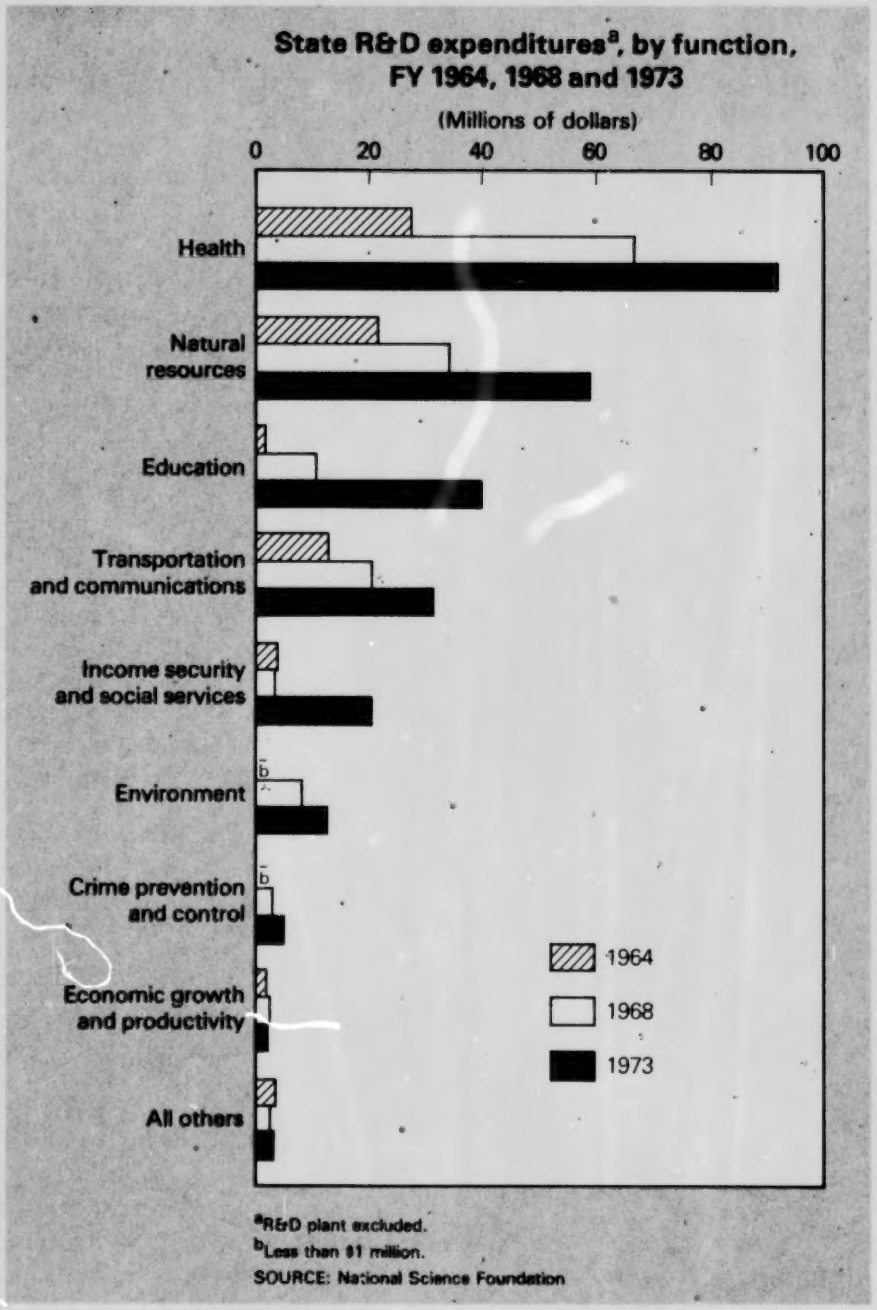
Section 2. BROAD FEATURES OF STATE R&D SUPPORT

The survey requested data on State agency R&D expenditures by a number of categories: character of work, field of science, performer, and source of funds. Staff further assigned data to functional categories. To attempt to determine trends, a brief exposition of R&D expenditures by these various categories on an aggregate basis is provided below. A brief discussion of R&D plant expenditures is also included.

Functions

In the nine years from 1964 to 1973 some shifts occurred in the emphases of State R&D programs taken as a whole. As the chart indicates, the two leading functions in 1964, 1968, and 1973 were health and natural resources. Throughout the entire period the areas of State government responsibility where greatest use was made of R&D methods were in biomedical research and the delivery of health services, and the management of agriculture and natural resources; e.g., fish, game, parklands, and coastal areas. Although the health function was most heavily funded, the natural resources function was the only one in which every State reported R&D expenditures in 1973.

The third-largest support area in 1973 was education, which had been only minimally supported in 1964. By 1968 the R&D activities in education had increased significantly, and in 1973 most States reported at least moderate amounts for educational R&D programs. California and Texas were particularly active and had the most influence on increasing the priority of education on an aggregate basis.



Transportation and communications, always one of the more important functional areas, dropped to fourth place in 1973 only because education R&D expenditures had grown rapidly enough to surpass those for this function. All the leading R&D support States invested relatively large amounts in the transportation area in 1973. Only three States failed to support any work within this function. As already mentioned, research is required as a condition of receiving Federal highway grants.

The income security and social services function was fifth most heavily supported in 1973, largely because of three federally funded State R&D programs in Washington, Indiana, and Colorado. This function tended to be among the leading State R&D functions in the 1964-73 period, although work in this area was far from evenly distributed among the States.

The environment function grew between 1964 and 1973 from virtually no R&D programs to a moderate amount of activity. Only five States, however, reported more than $1 million in R&D work in the environment area in 1973, and many reported none at all.

The remaining five functions—crime prevention and control, economic growth and productivity, area and community development and housing, science and technology, and energy development and conversion—reflected relatively small amounts of State R&D activity in all three reporting periods. The California efforts in the crime area brought about a moderate growth trend between 1964 and 1973. Otherwise, growth for these functions from 1964 to 1973 was slight or nonexistent.

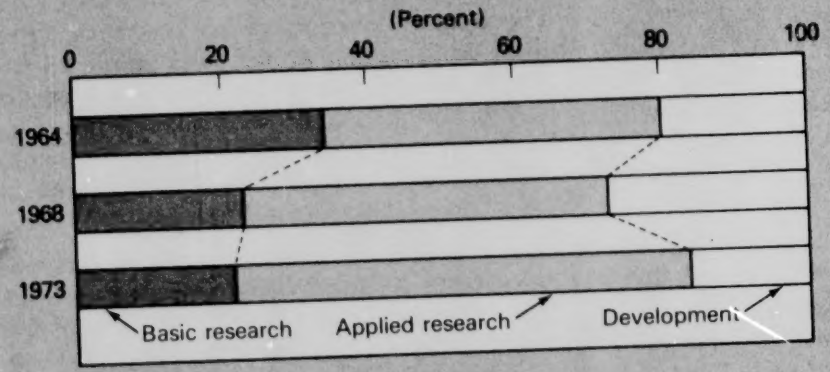
Character of Work

In all the years surveyed applied research was the chief form of State agency R&D activity. The data indicated a rising share of the total for applied research: from 46 percent in 1964 to 62 percent in 1973. In that timespan the share of basic research fell—from 35 percent in 1964 to 22 percent in 1973. The development share fluctuated; the high point was 27 percent in 1968 and the low point was 16 percent in 1973.

No finely drawn conclusions can be derived from these data. Inevitably, most State R&D efforts are of an applied nature. They are relatively short term, to help carry out State agency missions, and do not involve the heavy funding or work on complex machinery and instrumentation that characterizes so much of the Federal R&D effort. Whereas development makes up the chief area of Federal R&D activity, this phase of State R&D work is the least emphasized. State responsibilities do not include military security, and State budgets are not large enough in any event to permit investment in high-cost development activities.

As to basic research support by the States, most of it has been in the health area. The basic research share of the State R&D total has always been higher than the basic research share of the Federal R&D total. This seeming incongruity largely arises from the fact that the research share of State R&D expenditures is comparatively high relative to development and, thus, applied research and basic research shares are both high. As State agencies have gained more experience in reporting R&D data, however, they may have determined that more of their programs should be classified as applied research, reducing the size of the basic research share.

State agency R&D expenditures, by character of work, FY 1964, 1968, and 1973



SOURCE: National Science Foundation

Fields of Science

Within the total R&D efforts of State government agencies the relative support given different fields of science shifted considerably between 1964 and 1973. The life sciences continued to lead, but their share decreased. Clinical medical sciences were reported separately in the three State surveys, but they can logically be included with the biological sciences. When biological and clinical medical sciences are joined to form one field, their total represented 59 percent of State R&D efforts in 1964 but only 46 percent in 1973, despite steadily increased funding. The health and natural resources functions encompassed most of the biological sciences activity.

State agency R&D expenditures by field of science for selected years

[Dollars in thousands]

Field of science	1964	1965	1967	1968	1972	1973
Total, all fields	$72,002	$87,886	$131,187	$154,724	$234,923	$263,778
Biological sciences	24,311	27,692	49,297	56,030	75,134	83,280
Clinical medical sciences	18,216	22,170	26,071	30,590	35,957	38,123
Psychology	2,794	3,476	7,745	10,189	16,022	18,655
Physical sciences	882	1,238	779	1,363	5,396	7,065
Environmental sciences	2,453	2,808	8,771	11,634	11,021	13,851
Mathematics	85	256	875	1,066	1,603	1,860
Engineering	13,580	14,997	20,468	22,653	29,143	30,456
Social sciences	9,044	13,235	16,479	20,351	58,008	67,145
Other sciences	637	2,014	703	847	2,639	3,341

Very rapid growth was recorded for the social sciences, reflecting the expansion of education R&D programs. Whereas in 1964 this field made up 13 percent of the total, in 1973 it made up 25 percent. It was the second most heavily supported field that year.

Engineering, the third most heavily supported field in 1973 (and earlier years as well), gained each year in absolute support. The share for engineering dropped, however, from 19 percent in 1964 to 12 percent in 1973. Most engineering activity was found within the transportation function.

Psychology had become the fourth most strongly supported field by 1973, having shown relatively rapid growth. This field represented 7 percent of the State R&D total in 1973, an increase from 4 percent in 1964. Most work in psychology has been in the health area.

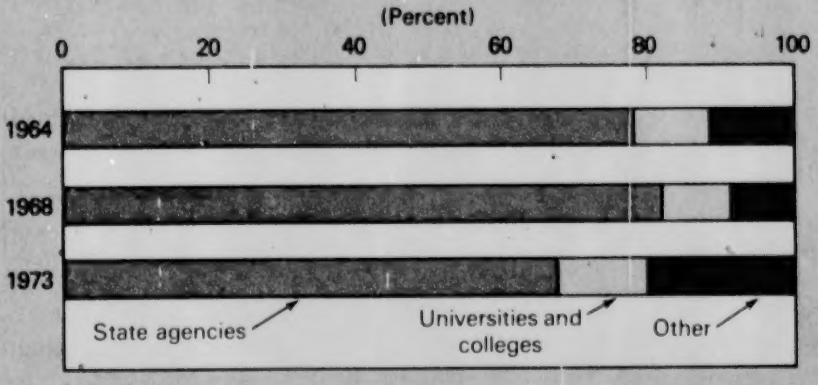
The environmental sciences increased less rapidly, accounting for 5 percent of the total in 1973, compared with 3 percent in 1964.

Performers

A distinctive feature of State R&D activities is the extent to which they are performed directly by State personnel, regardless of the source of funds. In 1964 the share performed intramurally was 78 percent, and this share rose to 82 percent in 1968. By 1973, however, the share had dropped to 68 percent, reflecting increasing diversity and experimentation in R&D program management.

Universities and colleges accounted for somewhat more of this work, but the "other" category showed greatest growth in performance. This latter category included private industry, nonprofit institutions, local governments, and multigovernmental agencies (interstate or regional authorities). Whereas universities and colleges performed 11 percent of the total in 1964 and 12 percent in 1973, the "other" performers carried out 11 percent of the total in 1964 and 20 percent in 1973. Many local government agencies, for example, were used in education R&D programs, and private organizations were used for management of the previously mentioned income maintenance experiment in Washington and Colorado.

State agency R&D expenditures[a], by performer, FY 1964, 1968, and 1973



[a] R&D plant excluded.

SOURCE: National Science Foundation

R&D Plant

State government agencies spent $7.2 million in 1972 and $9.6 million in 1973 on R&D plant. This kind of expenditure was a very small share of the State R&D and R&D plant expenditure total—3.5 percent in 1973. A few States accounted for the bulk of R&D plant expenditures in each year surveyed..

The chief characteristic of R&D plant expenditures is extreme fluctuation. In New York, as an example, R&D plant expenditures rose from $700,000 in 1972 to $5.1 million in 1973, and in Illinois they dropped from $2.1 million in 1972 to $389,000 in 1973. Such fluctuations are no indication of either policy changes or budget stringencies. R&D plant expenditures are high in years in which the purchase takes place, and no further expenditures are recorded, even though the plant or equipment may be used for many years thereafter to support R&D activities.

State agency R&D plant expenditures, by the 10 States leading in such support in 1973, for 1964, 1968, 1972, and 1973

[Dollars in thousands]

State	1964	1968	1972	1973
Total, all States	$5,350	$4,490	$7,176	$9,595
New York	3,475	205	721	5,141
California	16	391	1,162	1,310
Massachusetts	.....	30	10	794
Illinois	326	663	2,108	389
Ohio	.....	57	234	357
Virginia	186	220	148	265
Louisiana	.....	23	243	253
South Carolina	7	4	155	155
Texas	24	364	133	133
Colorado	105	60	83	108
All other States	1,211	2,473	2,179	690

Section 3. THE LEADING R&D SUPPORT STATES

The leading 15 States in R&D expenditures accounted for almost three-fourths of all State agency support in 1973. This proportion was approximately the same in all the other years surveyed, and the same States tended to remain in the group of 15 leaders, with New York, California, and Illinois the three leading States, in that order, for all years.

The general trend has been toward growth. Significantly, most States showed growth trends in both the 1964-68 and the 1968-73 periods. Only nine States spent less for R&D programs in 1968 than in 1964, and only five spent less in 1973 than in 1968. No State spent less in both periods.

Brief summaries are given below of the distinguishing features of the R&D activities of the 15 leading States. Although these States led on an overall program basis in 1973, some of the other States showed leading positions in certain functional areas—Alaska in natural resources, Minnesota in education, and Arizona in transportation. This situation points up the fact that States tend to focus their R&D programs in areas of special State need.

State agency R&D expenditures[1] for fiscal years 1964, 1968, and 1973

[Dollars in thousands]

States ranked by FY 1973 expenditures	1973	1968	1964	Average annual growth rate 1964-73
Total, all States	$263,778	$154,724	$72,002	+15.5
New York	60,330	36,631	14,357	+17.3
California	35,375	28,536	11,147	+13.7
Illinois	12,259	8,756	3,631	+14.5
Florida	11,145	3,190	1,666	+23.5
Texas	10,704	6,644	2,521	+17.4
Washington	10,635	3,222	1,474	+24.5
Pennsylvania	9,243	6,802	3,546	+11.2
Virginia	6,856	2,655	2,211	+13.4
Michigan	6,829	3,369	1,871	+15.5
Indiana	5,874	1,290	651	+27.7
Ohio	5,870	2,789	1,471	+16.6
New Jersey	5,596	3,079	3,332	+5.9
Massachusetts	5,279	1,635	693	+25.3
North Carolina	5,262	7,221	476	+30.6
Colorado	5,224	1,025	922	+21.2
Alaska	4,072	2,423	2,292	+6.6
Kentucky	3,925	2,536	849	+18.5
Oregon	3,907	1,290	733	+20.4
Wisconsin	3,788	2,387	1,616	+9.9
Georgia	3,300	1,677	1,169	+12.2
Tennessee	3,199	366	264	+31.7
Arizona	3,183	425	246	+32.9
Maryland	3,165	1,143	475	+23.5
Connecticut	3,032	1,797	840	+15.3
Connecticut	3,032	1,797	840	+15.3
Minnesota	2,849	2,358	1,082	+11.4
Hawaii	2,371	1,667	767	+13.4
Oklahoma	2,277	1,840	938	+10.4
West Virginia	2,207	687	840	+11.3
Louisiana	2,046	1,302	959	+8.8
Maine	2,006	706	756	+11.5
South Carolina	1,994	566	252	+25.8
Missouri	1,865	1,751	2,393	-2.7
Iowa	1,679	1,667	366	+18.4
Kansas	1,639	1,278	222	+24.8
Utah	1,636	1,985	94	+37.1
Alabama	1,359	366	715	+7.4
South Dakota	1,308	511	587	+9.3
Idaho	1,271	812	388	+14.1
Arkansas	1,204	835	340	+ 5.1
Mississippi	1,190	837	1,127	+0.6
Vermont	1,169	545	51	+41.4
Wyoming	991	398	246	+16.7
Nevada	934	82	53	+37.5
Montana	930	1,106	252	+15.6
New Mexico	825	659	128	+23.1
North Dakota	818	290	307	+11.5
Nebraska	452	359	564	-2.4
Rhode Island	292	880	55	+20.0
Delaware	269	84	9	+15.8
New Hampshire	150	268	58	+11.1

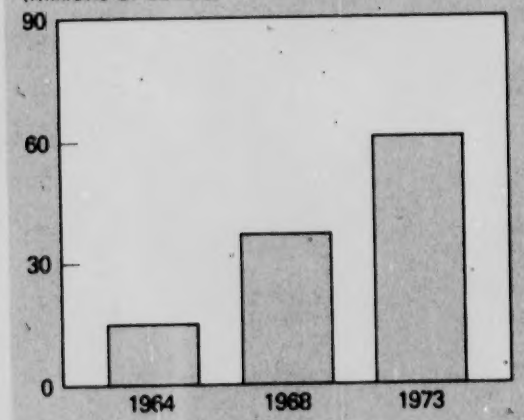
[1] R&D plant excluded

New York

Between 1964 and 1973 R&D expenditures of the agencies of New York State grew at an average annual rate of 17.3 percent, slightly more than the overall State average. In 1973 the total was $60.3 million.

The 1973 expenditures in the health area—$51 million—were large enough to account for more than one-half of the health effort of all State agencies. New York has a history of support for health research; the large population, university facilities, and wealth of the State are conducive to such support.

New York R&D expenditures



Major Characteristics, 1973

Functions:	Health - 84%
Source of funds:	State - 71% Federal - 27%
Character of work:	Applied research - 50% Basic research - 43%
Performers:	State agencies - 93%

Almost one-half of the New York health effort represented the activities of the Roswell Park Memorial Institute in the field of cancer research. Most of the rest was sponsored by the New York Department of Health, the New York Psychiatric Institute, and the Rockland State Hospital.

Other important areas of R&D activity were natural resources, $3.3 million; transportation and communications, $2.3 million; and environment, $1.5 million.

The ability and willingness of New York to spend so much more in State-appropriated funds than any other State are the chief reasons New York leads the other States in R&D expenditures by such a wide margin.

Whereas most States place by far their greatest efforts on applied research, New York provides almost as much support for basic research. The primary reason is the strong commitment of New York to R&D efforts in the health area, one that is more associated with support to basic research than any other.

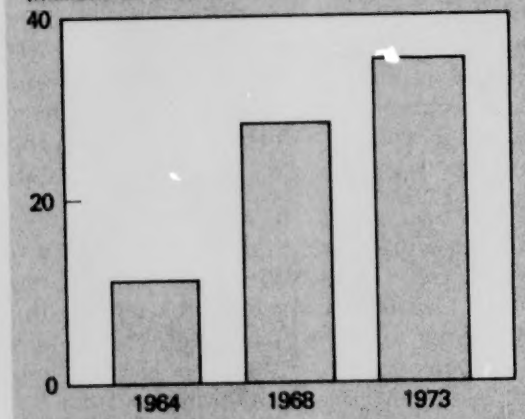
The large proportion of work performed intramurally by New York agencies was determined to a major extent by work in the health field. The health effort was almost entirely carried out by State personnel, as was most work in natural resources.

California

The average annual growth rate in R&D expenditures for California agencies was 13.7 percent between 1964 and 1973 and the total in 1973 was $35.4 million.

Health was the major functional area in 1973, with expenditures of $12.4 million, the second largest of any State. The chief sponsoring agency was the California Department of Health.

California R&D expenditures



Major Characteristics, 1973

Functions:	Health - 35% Natural resources - 23% Education - 19% Transportation and communications - 12%
Source of funds:	Federal - 64% State - 34%
Character of work:	Applied research - 74% Basic research - 16%
Performers:	State agencies - 68% Local governments - 15%

Natural resources, the second functional area, accounted for almost $8 million in funding, more than any other State by a wide margin. Sponsorship was chiefly by the Department of Conservation, the Department of Agriculture, and the Department of Fish and Game.

Education, the third functional area, reflected R&D expenditures of almost $7 million, almost twice as much as the next State, Texas. All funds were spent by the Department of Education.

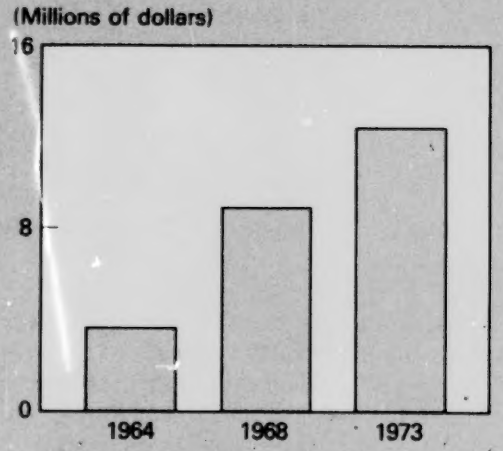
In 1973 California was the leading support State in transportation and communications, environment, and crime prevention and control.

California's strongest use of Federal R&D support is in the health and education areas (through the Department of Health, Education, and Welfare), but such use is also strong in other functional areas. Only in natural resources and environment were State-appropriated funds the major source of support.

Illinois

Between 1964 and 1973 Illinois agency R&D expenditures increased at almost the same average annual rate of growth as the aggregate for all States—14.5 percent. By 1973 the total was $12.3 million.

Illinois R&D expenditures



Major Characteristics, 1973

Functions:	Health - 35% Natural resources - 19% Environment - 14% Education - 13%
Source of funds:	State - 67% Federal - 32%
Character of work:	Applied research - 55% Basic research - 40%
Performers:	State agencies - 76% Universities and colleges - 11% Local governments - 10%

Health, the major function to receive support, encompassed mainly activities in mental health. Programs of the State Psychiatric Institute, the Department of Mental Health, the Institute for Juvenile Research, and a number of State mental hospitals made up the total.

Illinois supported 68 percent of its R&D efforts through State-appropriated funds. Such funding was largely directed to the three functional areas of health, natural resources, and environment. Federal aid was used for most of the programs in education, transportation and communications, income security and social services, and crime prevention and control.

The basic research share of the Illinois R&D effort at 40 percent, was relatively high; and here, also, this share was found mostly in the health area.

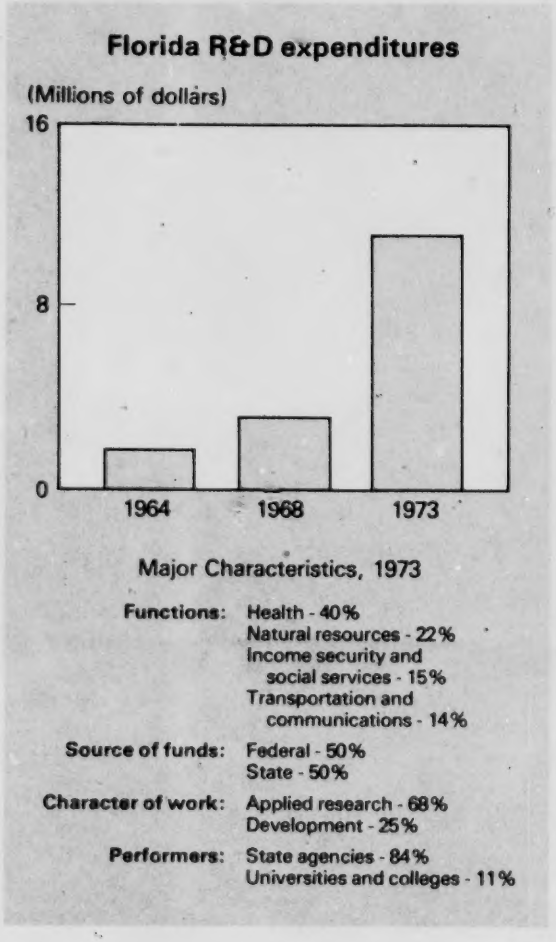
Florida

Between 1964 and 1973 R&D expenditures by Florida agencies rose at an average annual rate of 23.5 percent to a total of $11.1 million.

More than nine out of 10 of Florida's R&D dollars are concentrated in four functional areas: Health, natural resources, income security and social services, and transportation and communications. In 1973 health work was largely handled by the Department of Health and Rehabilitation Services; most programs were concerned with the planning and development of comprehensive health services. Virtually all of the natural resources R&D programs were carried out by three units: the Division of Marine Resources of the Department of Natural Resources and the Fresh Water Fish Division and the Game Management Division—both within the Game and Fresh Water Fish Commission.

In income security and social services the Department of Health and Rehabilitation Services was responsible for most of the R&D effort, mostly concerned with planning and evaluation of social services for the aged. All the transportation and communications effort was sponsored by the Department of Transportation. Much of this effort involved a range of research projects in road construction and maintenance.

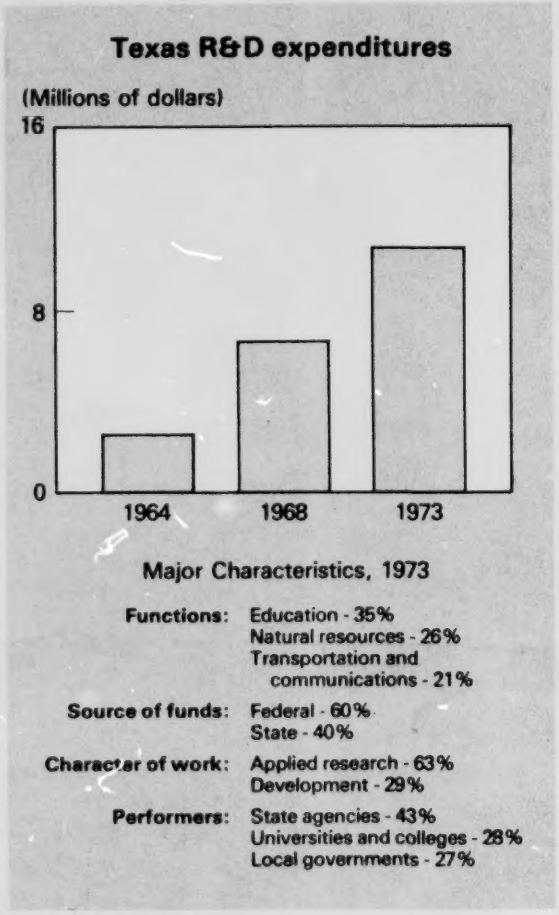
Support was evenly divided between State appropriations and Federal aid with Federal support high in health and income security and social services, and State support dominant in natural resources, and transportation and communications.



Texas

Between 1964 and 1973, State agency support for R&D programs grew at an average annual rate of 17.4 percent to a total of $10.7 million.

In 1973 Texas was second only to California in the amount of State agency support directed to education—$3.8 million. All R&D programs in education were sponsored by



the Texas Education Agency. Primary emphasis was placed on occupational and career education and on special education, with special weight given to a comprehensive language and/or learning disability program for high school students.

In natural resources most of the work was sponsored by the Parks and Wildlife Department in wildlife and coastal research and inland fisheries research. In transportation and communications, all the activity was reported by the Texas Highway Department.

The Federal Government provided most of the funds expended by Texas agencies with such support particularly high in education and transportation and communications.

Texas reported considerably more relative support for development than most States—30 percent. Most of this effort was concentrated in education and in transportation and communications. Development efforts for State agencies nationwide were also concentrated in these two functions.

The relatively large share for extramural performance in Texas reflected contracting by the Highway Department for work at State universities and colleges, and contracting by the Texas Department of Education with local government agencies.

Washington

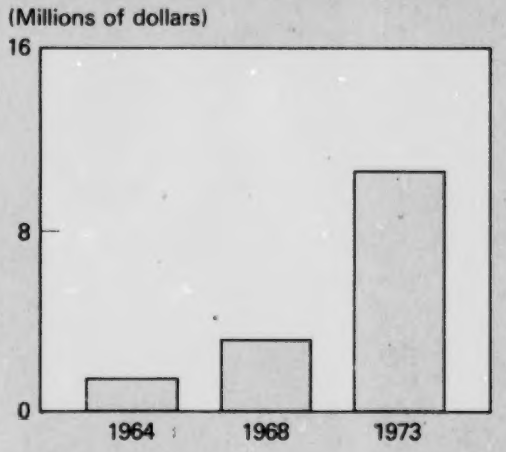
State agency R&D expenditures in Washington—totaling $10.6 million in fiscal year 1973—grew at an average annual rate of 24.5 percent between 1964 and 1973.

Washington is one of four States where income security and social services was the major functional area in 1973. This effort, amounting to $4.7 million, consisted of the Seattle Income Maintenance Experiment which was administered by the Department of Social and Health Services but was funded by HEW's Social and Rehabilitation Service (SRS). The program, along with similar SRS-funded programs in Colorado and Indiana, was undertaken to test the effects of a graduated family allowance system among a representative sample of the poor and near poor.

In 1973, natural resources was the second largest R&D area—$3.2 million. The effort here was carried out by the four Departments of Game, Fisheries, Natural Resources, and Agriculture. The third functional area was transportation and communications, where all of the work was sponsored by the Motor Vehicle Department and the Department of Highways.

Most of the Washington State agency effort was funded in 1973 through Federal aid. The entire income security and social services program was funded by SRS (HEW), and most of the support in transportation and communications was furnished by the National Highway Traffic Safety Administration (DOT) and the Federal Highway Administration (DOT). Only in natural resources were State-appropriated funds the major source of support.

Washington R&D expenditures



Major Characteristics, 1973

Functions:	Income security and social services - 44% Natural resources - 30% Transportation and communications - 13%
Source of funds:	Federal - 76% State - 18%
Character of work:	Applied research - 84% Development - 11%
Performers:	Industrial firms - 44% State agencies - 35% Universities and colleges - 11%

Contrary to the usual pattern, 65 percent of Washington R&D expenditures were directed to extramural performers in 1973. Most of this work was contracted to a private firm by the Department of Social and Health Services (the Seattle Income Maintenance Experiment), and this single contract caused the extramural share to be unusually high.

Pennsylvania

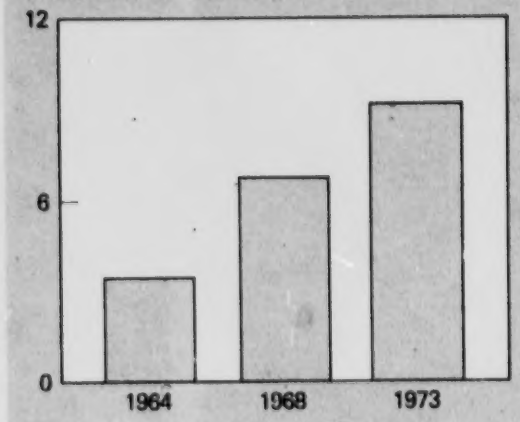
Pennsylvania spent $9.2 million for research and development in fiscal year 1973. Between 1964 and 1973 R&D funding in Pennsylvania increased at an average annual rate of 11.2 percent, the second smallest increase of any of the 15 leading States.

Under the health function, the leading area of effort, R&D programs were reported by the Eastern Pennsylvania Psychiatric Institute and by 11 State schools and hospitals. Under transportation and communications, the Department of Transportation was responsible for the work reported, and under education, the Department of Education was the reporting agency.

Most of the health support was provided through State-appropriated funds, but the Federal Highway Administration (DOT) furnished virtually all of the funds for transportation. For the other functional areas support was fairly evenly divided between Federal and State sources.

Most of the Pennsylvania programs were undertaken directly by State agencies; however, a considerably higher proportion of the State total was performed by universities and colleges than in the case of most States—37 percent, compared with an overall average of 12 percent. The Pennsylvania Departments of Transportation, Education, and Public Welfare were responsible for much of the work contracted to universities.

Pennsylvania R&D expenditures



Major Characteristics, 1973

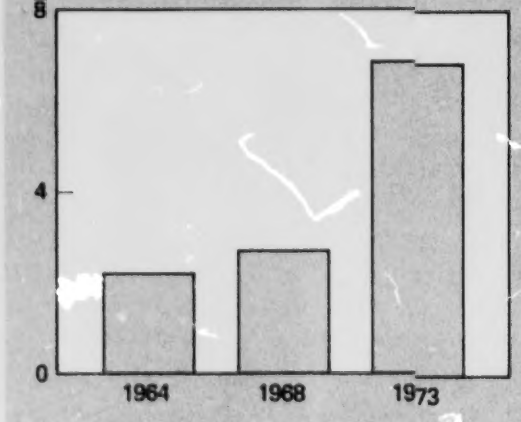
Functions:	Health - 37% Transportation and communications - 27% Education - 15%
Source of funds:	Federal - 52% State - 48%
Character of work:	Applied research - 66% Development - 18%
Performers:	State agencies - 56% Universities and colleges - 37%

Virginia

R&D expenditures by State agencies in Virginia totaled $6.9 million in fiscal year 1973. They grew at an average annual rate of 13.4 percent between 1964 and 1973.

In 1973 Virginia agencies focused their R&D efforts almost entirely in three areas. Under (1) natural resources, most of the programs were conducted by the Virginia In-

Virginia R&D expenditures



Major Characteristics, 1973

Functions:	Natural resources - 52% Transportation and communications - 21% Education - 19%
Source of funds:	State - 54% Federal - 44%
Character of work:	Applied research - 71% Basic research - 17%
Performers:	State agencies - 81% Local governments - 13%

stitute of Marine Science and involved studies dealing with the preservation of coastal environments, the biological resources of the coastal zone, the biology of coastal waters and wetlands, and coastal zone hydrography and geology. Under (2) transportation, the R&D programs were sponsored by the Highway Research Council. Under (3) education, the R&D activities were entirely sponsored by the Virginia Department of Education.

Although the Federal Government supported 43 percent of the R&D effort, education was the only area where more funds were provided from Federal sources (the Office of Education, HEW) than from State sources.

Most of the Virginia R&D total consisted of applied research; basic reseach was concentrated primarily in natural resources; and development was reported for the most part in the transportation and communications function.

Michigan

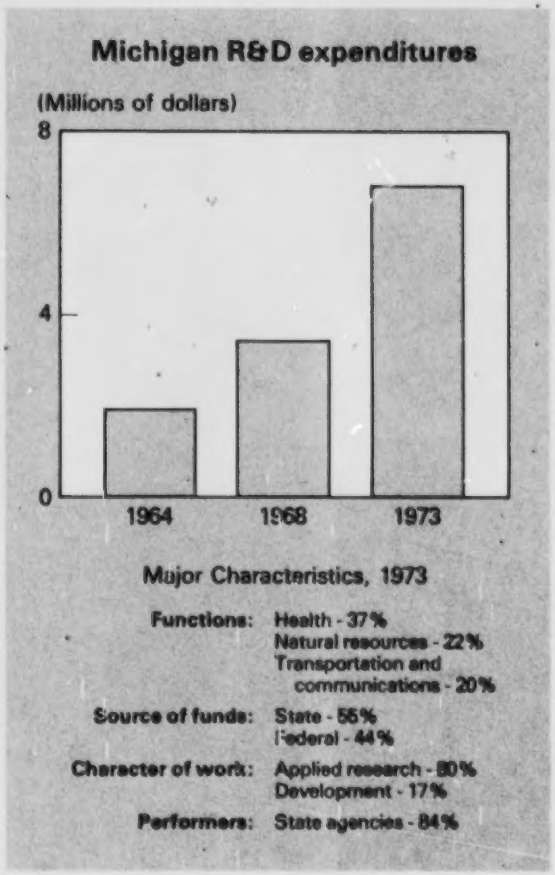
Michigan agency expenditures for research and development amounted to $6.8 million in fiscal year 1973. From 1964 to 1973 R&D expenditures grew at an average annual rate of 15.5 percent.

In 1973 the major R&D area was health. Health programs were sponsored by the Department of Public Health, the Lafayette Clinic, the Department of Social Services and several State hospitals. Natural resources, the next area, was entirely represented by the Department of Natural Resources. Transportation work was sponsored by the Department of State Highways and Transportation.

Although the Federal Government provided 45 percent of the funds, only in education was Federal aid the primary source of funding. For every other functional area, the State was the principal source of funds even though Federal agencies also contributed.

Michigan agencies placed major emphasis on applied research. Virtually all of the small amount devoted to basic research was in the health function. The effort assigned to development was primarily found within education.

In 1973 most Michigan R&D programs were performed intramurally. Work directed to universities and colleges and to local governments involved in education programs accounted for the remainder.



Indiana

State government agency expenditures for research and development in Indiana totaled $5.9 million in fiscal year 1973. The R&D expenditures of this State rose at an average annual rate of 27.7 percent between 1964 and 1973, the second highest rate among the 15 leading States.

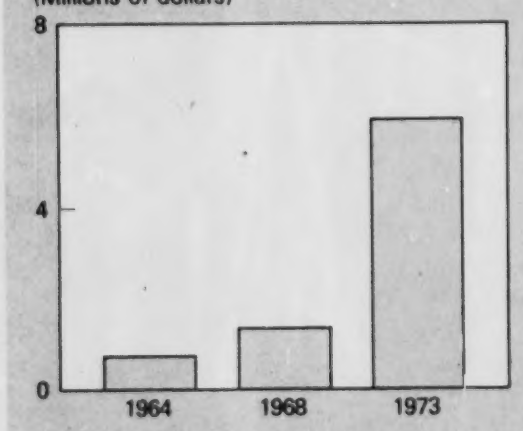
Under income security and social services the State Department of Public Welfare administered the establishment and testing of a graduated family allowance income maintenance program in Gary. The Indiana State Highway Commission was responsible for virtually all of the State transportation research and development, and several State hospitals and training centers contributed to R&D support in the health area. The Departments of Natural Resources and of Public Instruction completed the R&D picture with support which fell within the natural resources and education functions.

The high portion of Federal support was largely the result of the income security and social services program, funded by the Social and Rehabilitation Service (HEW).

The entire income security and social services program was reported as applied research, as was the entire natural resources effort.

Indiana was the only State where most of the research and development was performed by universities and colleges. All of the income security and social services program and all the transportation and communications programs were performed under contract by the University of Indiana and Purdue University.

Indiana R&D expenditures



Major Characteristics, 1973

Functions:	Income security and social services - 69% Transportation and communications - 11% Health - 11%
Source of funds:	Federal - 84% State - 16%
Character of work:	Applied research - 83%
Performers:	Universities and colleges - 80% State agencies - 17%

Ohio

State agencies in Ohio expended $5.9 million for research and development in fiscal year 1973. Such expenditures increased at an average annual rate of 16.6 percent between 1964 and 1973.

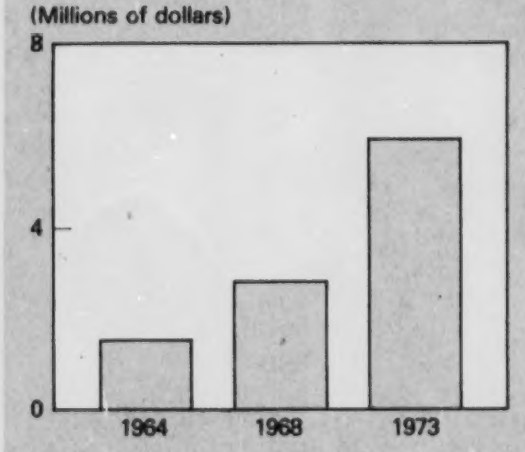
Ohio spent more relatively on education R&D programs than any other State. Only two States—California and Texas—spent more funds on education in 1973.

The education effort was largely sponsored by the State Department of Education. Transportation R&D programs were administered by the Department of Transportation. Programs in natural resources were undertaken by the Department of Natural Resources. Health programs were sponsored by the Department of Mental Health and Mental Retardation.

State-appropriated funds were chiefly used for education and health programs.

Like most other States, Ohio agencies are oriented to applied research; only in the health area was basic research significant.

Ohio R&D expenditures



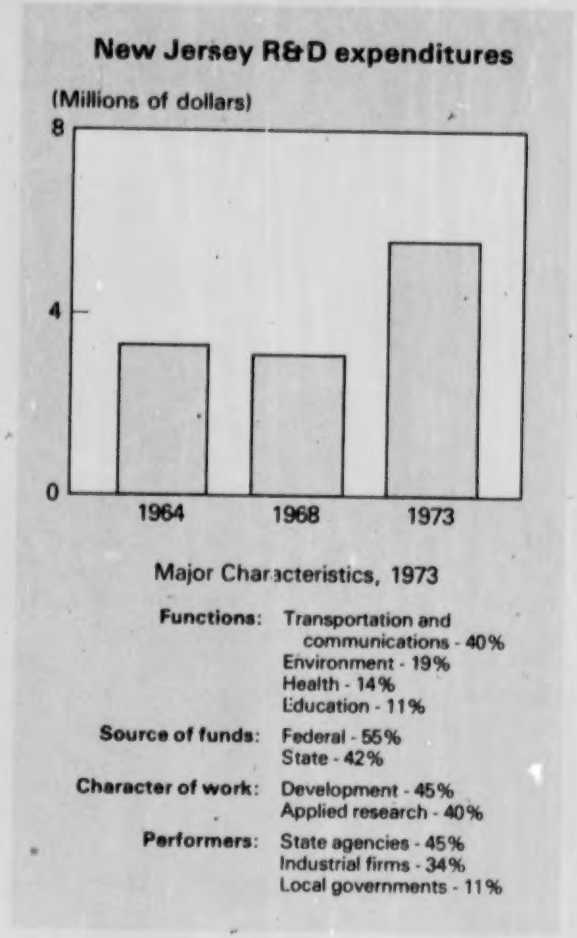
Major Characteristics, 1973

Functions:	Education - 47% Transportation and communications - 18% Natural resources - 17% Health - 13%
Source of funds:	State - 60% Federal - 40%
Character of work:	Applied research - 81% Basic research - 14%
Performers:	State agencies - 76% Universities and colleges - 16%

New Jersey

In fiscal year 1973 State government agencies in New Jersey spent $5.6 million for research and development. The average annual growth rate between 1964 and 1973 was 5.9 percent, the lowest among the 15 leading support States.

The New Jersey effort in 1973 was concentrated in five areas: Transportation and communications, environment, health, education, and area and community development and housing. The New Jersey Department of Transportation was responsible for the transportation R&D programs, the major one embodied in the demonstration of a Dial-a-Ride system. The New Jersey Environmental Protection Department reported all of the State environment R&D effort, most of which consisted of application of ERTS-1 data to the management and protection of the New Jersey coastal zone. A number of State agencies, including the Department of Health, the E. R. Johnstone Training and Research Center, and the New Jersey Neuropsychiatric Institute reported health R&D expenditures. The Department of Education was responsible for all of the education programs, and the Department of Community Affairs handled all area and community development and housing R&D work.



Federal funding, which made up more than one-half of the total, was provided mainly by the Federal Highway Administration (DOT). Other Federal support came from the HEW Office of Education and Food and Drug Administration. State-appropriated funds were principally allotted to programs of the Environmental Protection Department and the Department of Community Affairs.

New Jersey is one of the few States that reported more of its total effort as development than as applied or basic research. The State's largest single program, the Haddonfield Dial-a-Ride demonstration, was classified entirely as development. Development activity was also reported by the Department of Education and, to a lesser extent, by the Environmental Protection Department.

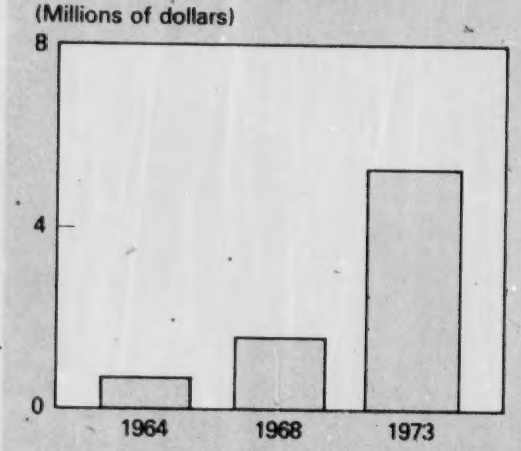
State agencies accounted for the largest share of R&D performance. Private firms, under contract, accounted for the next largest share, mostly for the Dial-a-Ride program.

Massachusetts

State agencies in Massachusetts spent $5.3 million on research and development in fiscal year 1973. Such expenditures rose at an average annual rate of 25.3 percent between 1964 and 1973.

R&D expenditures in Massachusetts in 1973 were distributed among health, environment, natural resources, education, transportation and communications, and crime prevention and control. Under health, a number of State hospitals reported R&D activity. The major one was the Boston State Hospital, and the Massachusetts Mental Health Center was also important. Under environment, R&D work was largely sponsored by the Department of Natural Resources, and the Metropolitan District Commission was responsible for most of the balance. Under natural resources all the programs were reported by the Department of Fisheries and Game and the Department of Natural Resources. The remaining R&D funds were spent by the Department of Education, the Department of Public Works, and the Massachusetts Committee on Criminal Justice.

Massachusetts R&D expenditures



Major Characteristics, 1973

Functions:	Health - 33% Environment - 24% Natural resources - 14% Education - 13%
Source of funds:	Federal - 57% State - 38%
Character of work:	Applied research - 48% Basic research - 41%
Performers:	State agencies - 50% Universities and colleges - 19% Industrial firms - 13% Local governments - 11%

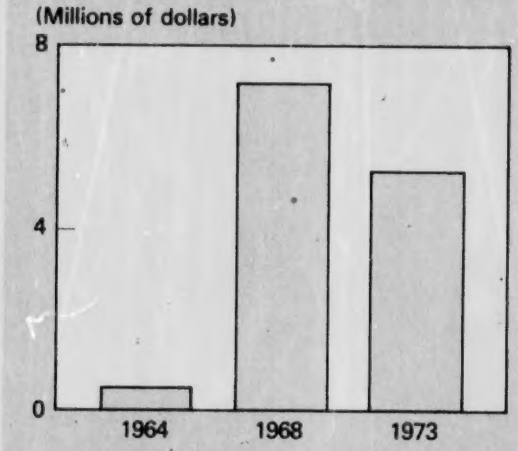
The Federal Government provided most of the R&D funds in 1973, focused in health, education, transportation, law enforcement, and natural resources. State-appropriated funds were used in the environment area.

Although Massachusetts spent more funds on applied research than basic research, the basic research share was much higher than in most States. Virtually all health R&D programs were classified as basic research.

North Carolina

State agency expenditures for research and development in North Carolina totaled $5.3 million in fiscal year 1973, a decline from $7.2 million in 1968. This decrease resulted entirely from a drop in R&D support to education. Between 1964 and 1973, however, R&D expenditures rose at an average annual rate of 30.6 percent, the highest growth rate among the 15 leading States.

North Carolina R&D expenditures



Major Characteristics, 1973

Functions:	Natural resources - 54% Education - 24% Health - 13%
Source of funds:	State - 60% Federal - 40%
Character of work:	Applied research - 53% Basic research - 27%
Performers:	State agencies - 51% Universities and colleges - 28% Local governments - 20%

In 1973 R&D activities covered five functional areas: Natural resources, education, health, transportation and communications, and science and technology. Under natural resources the Department of Agriculture was the major support agency, followed by the Department of Natural-Economic Resources and the Wildlife Resources Commission. Under education virtually all of the R&D effort was handled by the Department of Public Instruction. Under health most research and development was the responsibility of the Department of Mental Health. Under transportation, the State Highway Commission and under science and technology, the North Carolina Board of Science and Technology reported R&D programs. North Carolina was the leading State to report R&D funds in the science and technology area in 1973.

Federal funding was distributed to the areas of natural resources, education, health, and transportation.

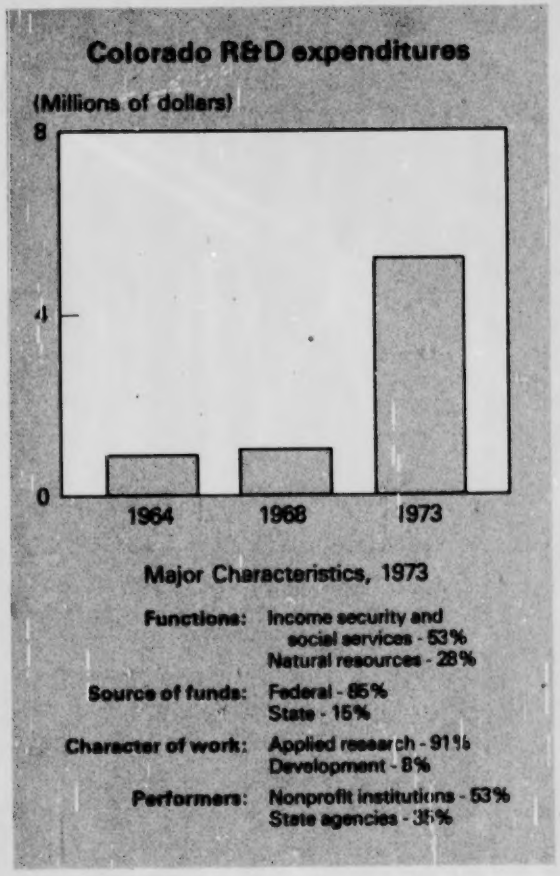
Although applied research was reported under all functions, basic research was limited chiefly to natural resources and health. Development was almost entirely limited to programs within the education and natural resources functions.

Universities and colleges accounted for 27 percent of the total effort, an unusually large share; most of the work represented Department of Agriculture programs carried on at State universities.

Colorado

In fiscal year 1973 State government agencies in Colorado spent $5.2 million for research and development. The average annual rate of increase between 1964 and 1973 was 21 percent.

Virtually all of the Colorado R&D activity is found in four functional areas: Income security and social services, natural resources, education, and health. The income security and social services function was entirely filled by the Denver Income Maintenance Experiment funded by the Social and Rehabilitation Service (HEW). The project was administered by the Colorado Department of Social Services. Most of the Colorado natural resources programs were conducted by the Division of Wildlife, Department of Natural Resources. Otherwise programs of the State Board for Community Colleges and Occupational Education and the Fort Logan Mental Health Center rounded out the total.



Only two other States (Vermont and Montana) reported higher degrees of Federal support than Colorado. The high Federal share reflected the Denver Income Maintenance Experiment.

The Denver Income Maintenance Experiment also accounted for the high share of R&D expenditures directed to private nonprofit organizations.

Distribution of State agency expenditures for research, development, and R&D plant as compared with other State indicators, fiscal year 1973

State	Total State agency R&D and R&D plant expenditures		Population		Total personal income		Total State government general expenditures	
	Rank	Percent of total	Rank	Percent of total	Rank	Percent of total	Rank	Percent of total
Total, all States (in millions)	$273		[1] [2]210		[2]$1,032,045		[3]$93,838	
New York	1	23.95	2	8.70	2	10.02	1	13.15
California	2	13.42	1	9.82	1	10.86	2	10.88
Illinois	3	4.63	5	5.35	3	6.26	4	5.17
Florida	4	4.11	8	3.66	9	3.46	9	3.19
Texas	5	3.96	4	5.62	6	4.96	6	3.76
Washington	6	3.90	22	1.63	20	1.66	17	1.96
Pennsylvania	7	3.39	3	5.67	4	5.64	3	6.22
Virginia	8	2.61	13	2.29	12	2.20	16	2.01
Michigan	9	2.51	7	4.31	7	4.77	5	4.66
Ohio	10	2.28	6	5.11	5	5.21	7	3.75
Massachusetts	11	2.22	10	2.77	10	2.95	8	3.29
Indiana	12	2.15	11	2.53	11	2.53	19	1.60
New Jersey	13	2.05	9	3.51	8	4.11	10	3.15
Colorado	14	1.95	28	1.16	26	1.19	31	.93
North Carolina	15	1.94	12	2.51	14	2.11	14	2.15
Alaska	16	1.50	50	.16	49	.18	36	.59
Kentucky	17	1.44	23	1.59	24	1.28	22	1.51
Oregon	18	1.43	31	1.06	29	1.01	29	1.03
Wisconsin	19	1.39	16	2.18	16	2.05	12	2.28
Georgia	20	1.23	14	2.28	17	1.97	15	2.07
Tennessee	21	1.19	17	1.97	21	1.58	23	1.43
Arizona	22	1.19	32	.98	31	.90	32	.88
Maryland	23	1.17	18	1.94	15	2.10	11	2.31
Connecticut	24	1.13	24	1.47	19	1.76	21	1.55
Minnesota	25	1.05	19	1.86	18	1.86	13	2.18
Hawaii	26	.87	40	.40	38	.43	34	.80
Louisiana	27	.84	20	1.79	22	1.40	18	1.95
Oklahoma	28	.83	27	1.27	28	1.08	25	1.22
West Virginia	29	.82	34	.85	35	.67	30	.99
South Carolina	30	.79	26	1.30	30	1.01	26	1.17
Maine	31	.76	38	.49	40	.39	38	.51
Missouri	32	.69	15	2.27	13	2.15	20	1.58
Iowa	33	.61	25	1.38	23	1.37	27	1.17
Kansas	34	.60	30	1.09	27	1.12	33	.80
Utah	35	.60	36	.55	37	.45	40	.50
Alabama	36	.50	21	1.69	25	1.28	24	1.40
South Dakota	37	.48	44	.33	47	.29	49	.28
Idaho	38	.47	42	.37	42	.32	43	.36
Mississippi	39	.46	29	1.09	32	.76	28	1.06
Arkansas	40	.44	33	.97	33	.73	35	.75
Vermont	41	.43	48	.22	48	.18	45	.32
Wyoming	42	.36	49	.17	50	.16	50	.21
Montana	43	.34	43	.34	44	.31	44	.34
Nevada	44	.34	47	.26	46	.30	47	.30
North Dakota	45	.31	45	.31	45	.30	46	.31
New Mexico	46	.30	37	.53	39	.40	37	.58
Nebraska	47	.17	35	.73	34	.72	39	.50
Rhode Island	48	.11	39	.46	36	.45	41	.50
Delaware	49	.10	46	.27	43	.31	42	.42
New Hampshire	50	.06	41	.38	41	.35	48	.29

[1] Provisional estimate of resident population as of July 1, 1973 (209,851,000).

[2] Both population and personal income totals include data for the District of Columbia. Therefore, the shares of total shown for the States within these two categories do not add up quite to 100 percent since the District of Columbia is omitted.

[3] This figures represents general expenditures minus expenditures for State institutions of higher education. R&D expenditures of State universities and colleges are not included in this report but are the subject of a separate survey and a separate report; therefore, the institutions that are responsible for those expenditures are excluded from general expenditures above.

SOURCES: U.S. Department of Commerce, Bureau of the Census, *Current Population Reports*, Series P-25, No. 520, July 1974; U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, Volume 54, No. 4, April 1974; U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, *State Government Finances in 1973*, Series GF73, No. 3, August 1974.

State R&D Expenditures Compared with Other Indicators

State agency R&D and R&D plant expenditures, when ranked by State, can be compared with such State indicators as population, total personal income, and total State government general expenditures by rank. As the table indicates, the more populous and wealth-producing States and those with higher State government general expenditures are usually those that place greater emphasis on R&D programs. The first 15 States in R&D expenditures in 1973 included 13 that were among the first 15 States in both population and total personal income. The two exceptions were Washington and Colorado, whose R&D expenditures were well ahead of their relative populations and income totals. The extent of their R&D activity was partially accounted for by the special income maintenance experiments already mentioned. The first 15 States in R&D expenditures also included 11 that were among the first 15 States in State government general expenditures.

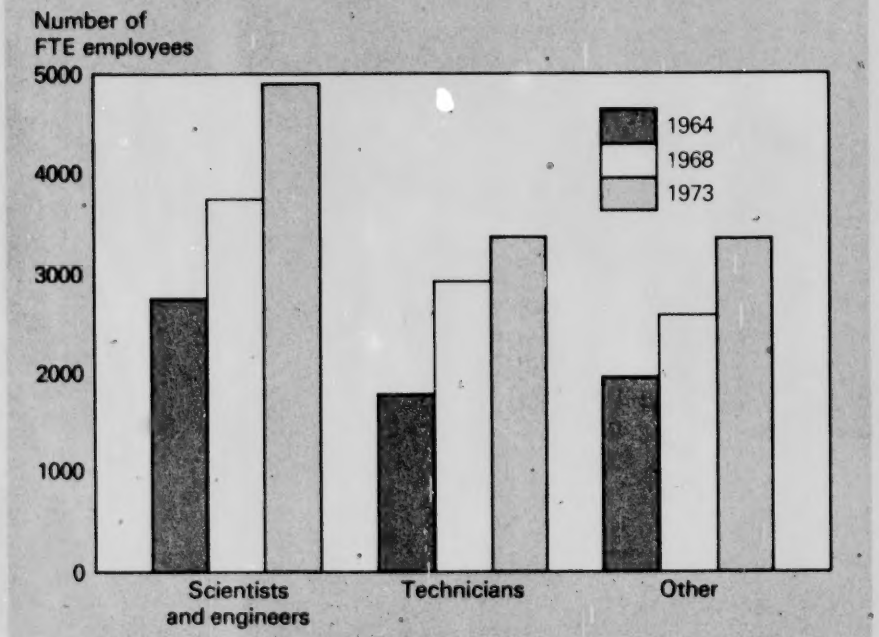
As to the next 35 States, Alaska, Kentucky, Oregon, and Hawaii were, like Washington and Colorado, notably ahead of other indicators in their R&D activities, and Louisiana and Missouri were notably behind.

Section 4. R&D MANPOWER

The survey defined personnel engaged in research and development as scientists, engineers, technicians, and other supportive personnel, such as typists, clerks, or administrative staff. Data on personnel covered only State agency intramural performance; they did not cover that portion of State agency R&D activities contracted out to other performers.

For this report data shown for R&D personnel are given on a full-time equivalent (FTE) basis. For example, if two scientists or engineers each worked six months on an R&D project, they were counted as one FTE scientist or engineer. Most State agencies do not employ persons solely for performing research and development, and therefore the employees of State agencies often engage in research and development on a part-time basis. This is not the case, however, with agencies within the larger R&D support States, like New York and California, that are able to hire full-time professionals to engage in R&D activities.

FTE[a] personnel engaged in research and development in State government agencies, by type of personnel, FY 1964, 1968, and 1973



[a] Full-time equivalent.
SOURCE: National Science Foundation

In 1972 State government agencies employed 10,798 FTE personnel in research and development: 43 percent, scientists and engineers; 29 percent, technicians; and 29 percent, other support personnel. In 1973 the total rose to 11,514 FTE personnel, with approximately the same percentages for each category. Between 1964 and 1973 the FTE personnel total climbed at an average rate of 6.7 percent per year (from 6,435 in 1964), yet the ratio of scientists and engineers to technicians and to other personnel remained virtually unchanged. During this same period R&D expenditures increased at an average annual rate of 16 percent, or more than double the rate of increase in personnel.

FTE personnel engaged in research and development in State agencies, by leading States, fiscal year 1973

State	Total	Scientists and engineers	Technicians	Other[1]
Total, all States	11,513.9	4,898.9	3,308.4	3,306.6
New York	3,607.0	950.6	1,174.9	1,481.5
California	1,429.5	694.5	380.1	354.9
Illinois	660.4	301.6	267.0	91.8
Florida	610.8	363.6	114.0	133.2
Virginia	499.0	246.2	118.6	134.2
Texas	385.9	134.9	147.6	103.4
Pennsylvania	311.0	138.0	109.4	63.6
Michigan	278.9	125.4	86.1	67.4
Washington	235.2	117.6	52.1	65.5
Wisconsin	207.1	130.0	49.8	27.3
All other States	3,289.1	1,696.5	808.8	783.8

[1] Typists, clerks, and personnel engaged in administration of research and development.

In 1973 the 10 leading States in R&D expenditures together employed 71 percent of the FTE personnel engaged in R&D efforts and 65 percent of the scientists and engineers. New York alone employed 31 percent of the FTE personnel total and 19 percent of the scientists and engineers.

The R&D cost per scientist or engineer in 1964 was approximately $21,000. In 1973 the cost had risen to almost $36,000. These amounts included not only salaries of scientists and engineers but also all supporting costs; i.e., the salaries of technicians and other support personnel, as well as supplies and all other overhead items. A large part of the 1964-73 increase was the result of inflation, although State R&D programs have been increasing in complexity and requiring a greater range of skills and equipment in their operations.

In 1973 the chief functional area to utilize FTE scientists/engineers, technicians, and other personnel was health, which accounted for 44 percent of the personnel total. The ratio of one scientist/engineer to one technician was the highest ratio of technicians to scientists/engineers for any function. Health R&D work depends heavily on technicians for performance of routine and repetitive tasks.

Natural resources, the next largest function, both in terms of FTE scientists/engineers and technicians and R&D expenditures, revealed a different ratio. This function accounted for 32 percent of the FTE personnel in 1973. There were nearly 2.4 scientists/engineers for each technician, due partly to the fact that much of the R&D effort is "in the field" where technical assistance is needed far less than in health.

FTE scientists/engineers and technicians engaged in research and development in State agencies, by functional area, fiscal year 1973

Function	Total	Scientists and engineers	Technicians
Total	8,207	4,899	3,308
Health	3,636	1,812	1,824
Natural resources	2,614	1,842	772
Education	235	206	29
Transportation and communications	937	477	460
Income security and social services	269	205	64
Environment	256	145	111
Crime prevention and control	126	104	22
Economic growth and productivity	81	67	14
All others	53	41	12

Education at first glance presents a paradox. It was the third largest function in 1973, but it accounted for only 4 percent of the FTE scientists/engineers and technicians engaged in R&D undertakings. The explanation is that most of the State-supported R&D work in education is not performed by State personnel, but by personnel of local governments. The ratio of seven scientists/engineers to each technician reflects the particular emphasis placed in the education field on employment of personnel with at least one degree.

Transportation and communications was the only major function whose relative shares of total State R&D expenditures and total State FTE scientists/engineers and technicians were approximately equal in 1973. The ratio of one scientist/engineer to one technician was close to that in health and indicated a heavy dependence on technology.

Scientists/engineers and technicians can be analyzed by field. The biological and clinical medical sciences accounted for 60 percent of the FTE scientists/engineers and technicians employed in 1973 but for only 46 percent of the R&D expenditures. In the social sciences FTE scientists/engineers represented only 13 percent of the personnel but accounted for 25 percent of total R&D expenditures.

FTE scientists/engineers and technicians engaged in research and development in State agencies, by field of science, fiscal year 1973

Field of science	Total	Scientists and engineers	Technicians
Total	8,207	4,899	3,308
	Percent distribution		
Biological sciences	41	44	38
Clinical medical sciences	19	15	25
Psychology	7	7	7
Physical sciences	3	3	3
Environmental sciences	5	6	5
Mathematics	1	1	1
Engineering	10	9	13
Social sciences	13	17	7
Other	1	1	1

APPENDIXES

A. Technical Notes
B. Statistical Tables
C. R&D Activities in State Universities and Colleges, 1973

D. Reproduction of Survey Questionnaire

E. Selected Bibliography

APPENDIX A
Technical Notes

These notes deal with the scope and methodology of the State R&D activities survey, definitions of terms, function classifications, and the relationship of the current report to previous reports conducted by the National Science Foundation on State government agency R&D activities and to the NSF *Survey of Scientific Activities of Institutions of Higher Education.*

Scope

The survey of State government agency R&D activities for fiscal years 1972 and 1973 was conducted for NSF by the Governments Division, Bureau of the Census, Social and Economic Statistics Administration, Department of Commerce. The survey, one in a series of NSF-sponsored studies on the R&D activities of State governments, sought data on the funding, personnel requirements, and nature of R&D programs and provided an additional basis for trend analysis of these R&D activities.

The universe consisted of agencies of all 50 States, excluding State universities and colleges and their affiliated medical schools, hospitals, agricultural experiment stations, and research centers. State universities and colleges are covered in another NSF survey. The list of State agency respondents was compiled from respondents to the previous State government surveys, State agencies covered in the Bureau of the Census annual employment survey, lists of State agencies receiving grants and contracts from Federal agencies, and a Bureau of Labor Statistics listing of research personnel in State governments. For each State, the agency list was sent to the chief budget officer. Budget officers were requested to screen the list of agencies for those that sponsored R&D programs and add any agencies that had been omitted. For each sponsoring agency, names and addresses of key contacts were to be supplied.

Method

Questionnaires were sent to all agencies with a prior involvement in R&D activity as well as certain other agencies, regardless of State budget officer recommendations. These were departments of health, education, fish and game, and transportation, which historically have reflected some R&D activities. State agencies appearing on Federal grant lists for either fiscal year 1972 or fiscal year 1973 were also included, regardless of budget officer recommendations.

Since early responses were received from 11 budget officers, questionnaires were mailed to the agencies in these "control" States on November 10, 1973, one month prior to the scheduled first mailing. This action provided early and valuable measures of quality and speed of response. The quality of the final responses and the percent of agencies reporting R&D expenditures among all those canvassed closely paralleled the returns from the "control" units.

R&D involvement is far from uniform among the States. Despite telephone followup to all nonrespondents, only 38 State budget offices reported, and several budget officers stated that they had no records available to form a basis for ready or accurate response to the survey.

Survey forms were mailed to State agencies in the remaining 39 States on December 7, 1973. Two subsequent mailings, approximately one month apart, were made to nonresponding agencies. When questionnaires were returned, they were screened for completeness and internal consistency. Followup of incomplete, inconsistent, and questionable responses took place in January, and a nonresponse followup occurred in February. This last mailing was to all nonrespondent agencies that had reported R&D expenditures in the last survey, that were on a Federal grants list, or that were departments of education, transportation, health, or fish and game. The collection phase of the survey was scheduled for closeout on March 29, 1974, although additional data obtained during an intensive review in April were included as received.

Survey operations were managed for NSF by the Bureau of the Census, which also made all data tabulations. NSF received copies of all returned survey forms containing R&D data. The NSF Government Studies Group staff determined which projects met R&D definitions, assigned to each project a function code, noted whether data change or followup was required by Census or NSF, and notified Census accordingly. Followup results were returned to NSF for final approval before the data could be considered final.

A response rate of approximately 98 percent was obtained. An initial universe of 1,309 units was reduced to 1,276 during the course of the survey as a result of organizational phaseouts and agency consolidations. Only 29 agencies failed to respond, with a maximum of only three nonrespondents in any State. Five hundred and nineteen agencies, or 40.7 percent of those responding, reported R&D expenditures.

Organization

Tables developed by the Bureau of the Census for the State agency report show for each of the 50 States R&D expenditures by function, field of science, performer and source of funds. Each of these categories was further subdivided by character of work; i.e., basic research, applied research, and development. R&D plant expenditures are also shown for each State. R&D manpower data appeared in another series of tables. Not all of these tables are included in appendix B because of their great detail, but they are available on request.

These tables formed the basis for the core of this report. The first section of the report provides historical background and discusses some of the fac-

tors bearing on State agency R&D activity. (See appendix E for references.) The next three sections give R&D data on the 50 States on an aggregate basis, on the 15 leading States, and on R&D manpower.

Definitions

The survey questionnaire was developed by NSF and was similar to the questionnaire used in the first two NSF surveys of State government agency R&D activities. (See copy of questionnaire in appendix D.) The survey was designed to elicit data on R&D expenditures by performer, source of funds, field of science, and character of work. Classification by function was undertaken by NSF staff. R&D plant data and R&D personnel data were also sought.

The following definitions were used as the basis for reporting to the survey:

RESEARCH AND DEVELOPMENT

Research is systematic, intensive study directed toward fuller scientific knowledge or understanding of the subject studied. Research may be classified as either basic or applied. In *basic research* the investigator is concerned primarily with gaining fuller knowledge or understanding of the subject under study. In *applied research* the investigator is primarily interested in a practical use of the knowledge or understanding for the purpose of meeting a recognized need.

Development is the systematic use of scientific knowledge directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes. It represents the application of the findings of research to meet practical problems.

R&D plant consists of facilities and fixed equipment used in support of research and development. Included are the acquisition of, construction of, major repairs to, or alterations in structures, works, equipment, facilities, or land, for use in the performance of research and development. Excluded from the R&D plant category are expendable equipment and miscellaneous items such as office furniture and supplies.

R&D PERSONNEL

Scientists and engineers are persons engaged in scientific or engineering work, and having at least a bachelor's degree or the equivalent in work experience in the appropriate field.

Technicians are persons engaged in scientific or engineering work, and having the technical knowledge equivalent to at least two years of training beyond the high school level in the appropriate field.

Other personnel are typists, clerks, and administrative personnel supporting the R&D effort.

FUNCTIONAL AREAS

For purposes of this survey State R&D activities were classified into 11 separate functional categories. These were health, natural resources, education, transportation and communications, income security and social services, environment, crime prevention and control, economic growth and productivity, area and community development and housing, science and technology, and energy development and conversion. NSF decided on the classification of R&D expenditures by function on the basis of program descriptions and other information furnished by the respondents.

The functions were chosen to make visible the most important R&D objectives as reflected in agency programs. The data were additive to 100 percent so that no overlap occurred between programs or functions. Programs were assigned to functions on the basis of the primary purposes of the program, and when an R&D program extended into more than one functional area, the function used was the one that represented the primary purpose.

Relation to Previous Reports on State R&D Expenditures

The current report is derived from the third survey covering the R&D expenditures of State government agencies. The first two surveys covered fiscal years 1964 and 1965, and 1967 and 1968.[1] In both instances the same general definitions and guidelines were used as were followed in the latest survey, for fiscal years 1972 and 1973. As a result, the series in the various categories are comparable.

The only difference between the previous reports and the current one is found in their functional classification systems. In the earlier reports functional categories were taken from those used by the Bureau of the Census to collect and report financial data on overall activities of State governments. For the current report a revised category list was used that was based on the function system employed by NSF in its annual report on Federal R&D funding by function.[2] NSF staff reconstructed data from the 1964-65 and 1967-68 State surveys to achieve comparability with the 1972-73 classification system so that trends could be noted. An overlapping functional category—medical and health-related—was added to the 1967-68 survey but was not included in the 1972-73 report.

Relation to the NSF Survey of Institutions of Higher Education

The 1972-73 survey on R&D expenditures of State government agencies did not include R&D expenditures of State universities and colleges. These institutions are included in the recurrent NSF *Survey of Scientific Activities of Institutions of Higher Education*, which covers all universities and colleges, both public and private.[3] Appendix C provides a brief summary of key features of R&D expenditures of State universities and colleges, with accompanying tables. These are provided to give a total perspective on State public R&D expenditures.

Some of the terms used in the survey of universities and colleges are different from those used in the survey of State government agencies on which this report is based. The concepts are the same, however. The data shown in the statistical tables in appendix C are from the university and college survey, but the terminology is the same as that used in the State agency survey and in this report. A small amount of R&D work performed for State government agencies on a contract basis is included in the data on R&D expenditures of State universities and colleges; the total in 1973 was $28 million.

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[1] National Science Foundation, *R&D Activities in State Government Agencies, Fiscal Years 1964 and 1965* (NSF 67-16) and *Research and Development in State Government Agencies, Fiscal Years 1967 and 1968* (NSF 70-22) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office).

[2] See National Science Foundation, *An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1975* (NSF 74-313) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1974.)

[3] See National Science Foundation, *Expenditures for Scientific Activities at Universities and Colleges, Fiscal Year 1973*, in preparation.

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Table B-1.—State agency expenditures for research and development and R&D plant, by State and character of work, fiscal years 1972 and 1973

[Dollars in thousands]

State	Total R & D and R & D plant		Research and development								R & D plant	
			Total		Basic		Applied		Development			
	1972	1973	1972	1973	1972	1973	1972	1973	1972	1973	1972	1973
Total	242,098	273,371	234,923	263,778	52,601	57,626	142,524	163,375	39,798	42,776	7,176	9,595
Alabama	1,323	1,359	1,323	1,359	54	57	892	891	377	411	-	-
Alaska	3,795	4,097	3,749	4,072	264	331	3,450	3,462	34	279	36	25
Arizona	2,974	3,241	2,966	3,183	226	394	1,560	1,678	1,180	1,111	8	59
Arkansas	1,506	1,210	1,503	1,204	119	124	605	568	779	511	3	7
California	31,942	36,685	30,780	35,375	4,150	5,825	22,366	26,073	4,263	3,477	1,162	1,310
Colorado	3,939	5,332	3,856	5,224	59	60	3,504	4,758	293	406	83	108
Connecticut	3,120	3,077	3,071	3,032	2,470	2,399	463	489	137	144	49	46
Delaware	209	269	209	269	-	-	138	159	70	100	-	-
Florida	9,708	11,221	9,640	11,145	769	817	6,195	7,585	2,676	2,743	69	76
Georgia	3,125	3,360	3,125	3,300	434	389	1,903	1,403	1,088	1,208	-	60
Hawaii	2,325	2,375	2,321	2,371	-	-	739	1,370	1,582	1,001	4	4
Idaho	1,271	1,271	1,271	1,271	21	23	1,250	1,248	-	-	-	-
Illinois	14,392	12,647	12,284	12,259	5,394	4,888	6,139	6,737	751	634	2,108	389
Indiana	4,250	5,874	4,250	5,874	498	551	3,501	4,899	250	423	-	-
Iowa	1,439	1,679	1,439	1,679	16	84	728	915	695	680	-	-
Kansas	1,201	1,645	1,192	1,639	4	98	1,064	1,360	123	180	10	6
Kentucky	3,815	3,925	3,812	3,925	50	185	2,263	2,362	1,499	1,378	4	-
Louisiana	2,007	2,299	1,764	2,046	245	279	1,438	1,587	81	180	243	253
Maine	2,116	2,065	1,827	2,003	415	427	929	1,075	483	505	289	58
Maryland	2,471	3,193	2,441	3,165	753	733	1,020	1,643	668	788	30	27
Massachusetts	3,610	6,073	3,600	5,279	1,349	2,169	1,851	2,512	399	598	10	794
Michigan	5,511	6,865	5,451	6,829	268	256	4,354	5,446	829	1,128	60	36
Minnesota	2,327	2,859	2,312	2,849	21	20	1,453	1,492	838	1,335	15	10
Mississippi	1,095	1,257	1,095	1,190	68	68	649	797	378	324	-	67
Missouri	1,758	1,879	1,753	1,865	38	70	1,701	1,704	14	92	6	14
Montana	703	939	696	930	42	177	612	713	43	40	7	9
Nebraska	392	452	392	452	164	145	165	224	63	84	-	-
Nevada	770	935	769	934	736	909	-	4	34	22	(a)	(a)
New Hampshire	1,092	150	192	150	-	-	157	135	35	15	900	-
New Jersey	3,687	5,607	3,606	5,596	660	858	1,359	2,218	1,586	2,519	82	12
New Mexico	878	825	878	825	-	-	615	610	263	215	-	-
New York	55,785	65,471	55,064	60,330	24,856	26,089	27,317	30,380	2,891	3,861	721	5,141
North Carolina	4,784	5,290	4,757	5,262	1,306	1,417	2,525	2,800	927	1,044	27	28
North Dakota	809	841	793	818	-	15	649	660	145	143	16	23
Ohio	3,782	6,227	3,548	5,870	848	810	2,295	4,753	404	307	234	357
Oklahoma	2,118	2,277	2,097	2,277	133	119	1,661	1,817	303	341	21	-
Oregon	3,326	3,907	3,326	3,907	12	25	1,318	1,554	1,996	2,328	-	-
Pennsylvania	9,697	9,254	9,289	9,243	1,589	1,465	6,114	6,092	1,586	1,686	408	11
Rhode Island	218	292	218	292	53	86	195	206	-	-	-	-
South Carolina	2,423	2,149	2,268	1,994	127	112	1,645	1,276	496	605	155	155
South Dakota	1,278	1,308	1,278	1,308	630	631	635	661	13	15	-	-
Tennessee	3,378	3,261	3,341	3,199	1,325	1,366	1,125	1,049	891	784	37	62
Texas	10,120	10,837	9,987	10,704	833	796	6,298	6,774	2,855	3,134	133	133
Utah	1,694	1,637	1,693	1,636	44	44	593	474	1,056	1,118	1	1
Vermont	1,493	1,169	1,483	1,169	13	6	140	181	1,330	982	10	-
Virginia	6,006	7,121	5,858	6,856	755	1,136	4,318	4,896	784	823	148	265
Washington	9,815	10,655	9,781	10,635	476	529	8,574	8,944	730	1,162	34	20
West Virginia	2,084	2,232	2,058	2,207	234	262	930	1,053	894	893	25	24
Wisconsin	3,732	3,793	3,732	3,788	80	84	2,714	2,710	939	994	-	5
Wyoming	786	991	756	991	-	-	707	968	50	23	29	-

[a] Less than $500.

Table B-2.—State agency expenditures for research and development, by State and functional area, fiscal year 1972

[Dollars in thousands]

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	234,923	83,714	50,708	35,968	30,495	17,671	9,793	3,575	1,613	626	614	147
Alabama	1,323	130	147	774	193	-	78	-	-	-	-	-
Alaska	3,749	119	3,578	9	43	-	-	-	-	-	-	-
Arizona	2,966	-	674	-	2,081	106	65	40	-	-	-	-
Arkansas	1,503	-	188	470	199	420	-	227	-	-	-	-
California	30,780	10,368	6,012	5,529	4,857	147	2,478	1,202	-	122	65	-
Colorado	3,856	358	1,120	393	116	1,870	-	-	-	-	-	-
Connecticut	3,071	1,194	1,442	-	435	-	-	-	-	-	-	-
Delaware	209	-	138	70	-	-	-	-	-	-	-	-
Florida	9,640	3,934	1,795	863	1,446	1,353	-	-	248	-	-	-
Georgia	3,125	493	491	1,756	382	-	-	-	-	-	-	-
Hawaii	2,321	39	587	1,364	38	152	92	-	50	-	-	-
Idaho	1,271	-	1,224	-	11	-	20	-	16	-	-	-
Illinois	12,284	5,133	2,001	1,323	1,249	400	1,654	462	63	-	-	-
Indiana	4,250	506	309	130	630	2,674	-	-	-	-	-	-
Iowa	1,439	239	354	526	193	95	-	-	13	-	20	-
Kansas	1,192	114	127	575	311	9	21	33	-	-	-	-
Kentucky	3,812	100	641	942	710	685	297	-	437	-	-	-
Louisiana	1,764	152	826	10	740	-	35	-	-	-	-	-
Maine	1,827	37	1,304	171	135	13	166	2	-	-	-	-
Maryland	2,441	1,158	306	273	331	15	173	-	-	185	-	-
Massachusetts	3,600	1,076	643	528	415	62	621	254	-	-	-	-
Michigan	5,451	1,590	1,386	589	1,346	540	-	-	-	-	-	-
Minnesota	2,312	100	321	1,484	294	60	-	-	-	52	-	-
Mississippi	1,095	45	-	586	311	25	63	65	-	-	-	-
Missouri	1,753	5	981	357	317	-	63	-	-	21	-	-
Montana	696	2	544	36	15	-	40	60	-	-	-	-
Nebraska	392	-	203	-	174	-	-	-	15	-	-	-
Nevada	769	-	659	-	21	34	-	-	-	-	55	-
New Hampshire	192	-	123	-	10	-	59	-	-	-	-	-
New Jersey	3,606	870	227	615	1,693	-	-	-	-	200	-	-
New Mexico	878	-	748	-	80	-	70	-	-	-	-	-
New York	55,064	46,737	2,786	907	2,132	487	1,279	386	148	-	56	146
North Carolina	4,757	575	2,657	988	213	-	-	43	-	33	249	-
North Dakota	793	123	176	289	37	-	-	-	168	-	-	-
Ohio	3,548	960	478	950	939	210	-	-	10	-	-	-
Oklahoma	2,097	460	889	235	448	-	66	-	-	-	-	-
Oregon	3,326	-	1,191	1,841	67	-	183	-	44	-	-	(a)
Pennsylvania	9,289	3,275	393	1,808	2,080	760	794	13	-	-	167	-
Rhode Island	248	-	195	-	53	-	-	-	-	-	-	-
South Carolina	2,268	25	911	891	-	239	-	173	25	-	3	-
South Dakota	1,278	-	256	546	112	-	351	-	13	-	-	-
Tennessee	3,341	901	871	1,188	381	-	-	-	-	-	-	-
Texas	9,987	982	2,509	3,478	2,292	262	331	154	-	-	-	-
Utah	1,693	336	167	1,056	49	-	5	81	-	-	-	-
Vermont	1,483	112	113	-	13	1,161	10	74	-	-	-	-
Virginia	5,858	371	3,254	8[illegible]	1,251	7	-	-	189	-	-	-
Washington	9,781	96	2,553	433	1,080	4,976	439	3	187	13	-	-
West Virginia	2,058	190	709	827	204	37	-	30	-	-	-	-
Wisconsin	3,732	483	1,177	302	284	873	340	273	-	-	-	-
Wyoming	756	340	264	42	103	-	-	-	8	-	-	-

[a] Less than $500.

Table B-3.—State agency expenditures for research and development, by State and functional area, fiscal year 1973

[Dollars in thousands]

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	263,778	92,042	50,103	39,934	31,198	20,202	12,198	4,564	1,753	1,409	793	582
Alabama	1,359	131	180	774	151	12	111	-	-	-	-	-
Alaska	4,072	30	3,768	80	193	-	-	-	-	-	-	-
Arizona	3,183	154	645	-	2,146	102	35	100	-	-	-	-
Arkansas	1,204	-	166	438	154	250	-	174	3	-	-	18
California	35,375	12,350	7,976	6,810	4,132	149	2,165	1,466	50	156	122	-
Colorado	5,224	374	1,473	451	40	2,787	-	100	-	-	-	-
Connecticut	3,032	1,105	1,485	-	434	8	-	-	-	-	-	-
Delaware	269	-	169	100	-	-	-	-	-	-	-	-
Florida	11,145	4,476	2,458	664	1,565	1,667	20	-	294	-	-	-
Georgia	3,300	739	554	1,678	274	55	-	-	-	-	-	-
Hawaii	2,371	45	984	828	73	215	105	-	119	-	-	-
Idaho	1,271	-	1,230	-	23	-	7	-	11	-	-	-
Illinois	12,259	4,281	2,332	1,565	1,123	584	1,735	572	68	-	-	-
Indiana	5,874	625	286	277	635	4,050	-	-	-	-	-	-
Iowa	1,679	316	537	546	146	67	-	7	37	-	24	-
Kansas	1,639	155	132	495	384	327	103	44	-	-	-	-
Kentucky	3,925	122	856	697	900	597	352	-	401	-	-	-
Louisiana	2,046	302	862	10	748	-	124	-	-	-	-	-
Maine	2,006	23	1,386	196	135	9	254	3	-	-	-	-
Maryland	3,185	1,154	606	365	242	8	105	13	-	615	-	58
Massachusetts	5,279	1,763	728	694	460	-	1,276	359	-	-	-	-
Michigan	6,829	2,501	1,535	513	1,301	589	-	-	-	-	-	-
Minnesota	2,849	118	332	1,976	296	32	-	55	-	40	-	-
Mississippi	1,190	45	25	550	305	25	63	168	-	-	-	-
Missouri	1,865	30	954	458	232	-	86	-	-	84	-	-
Montana	930	35	620	30	46	-	119	80	-	-	-	-
Nebraska	452	-	321	-	138	-	-	56	31	6	-	-
Nevada	934	51	775	-	21	24	-	-	-	-	63	-
New Hampshire	150	-	107	-	-	-	42	-	-	-	-	-
New Jersey	5,596	761	232	627	2,237	157	1,082	-	-	500	-	-
New Mexico	825	-	715	-	60	-	49	-	-	-	-	-
New York	60,330	50,624	3,266	987	2,271	471	1,518	377	145	-	231	451
North Carolina	5,262	695	2,836	1,240	243	-	-	-	-	6	241	-
North Dakota	818	120	305	286	137	-	4	-	66	-	-	-
Ohio	5,870	736	980	2,785	1,034	325	-	-	10	-	-	-
Oklahoma	2,277	517	957	248	280	-	144	131	-	-	-	-
Oregon	3,907	-	1,252	1,867	156	-	538	-	58	-	-	36
Pennsylvania	9,243	3,424	614	1,380	2,522	628	569	25	-	-	110	-
Rhode Island	292	5	201	-	53	-	33	-	-	-	-	-
South Carolina	1,994	103	904	713	-	91	-	139	28	-	11	-
South Dakota	1,308	-	281	573	64	-	395	-	15	-	-	-
Tennessee	3,199	1,052	913	1,126	83	-	24	-	-	-	-	-
Texas	10,704	1,015	2,790	3,759	2,277	404	288	172	-	-	-	-
Utah	1,636	276	170	1,097	55	-	5	32	-	-	-	-
Vermont	1,169	123	149	-	6	797	7	87	-	-	-	-
Virginia	3,854	425	3,556	1,275	1,419	7	-	-	174	-	-	-
Washington	10,535	183	3,200	458	1,403	4,703	456	-	329	3	-	-
West Virginia	2,207	194	864	827	119	28	28	149	-	-	-	-
Wisconsin	3,788	464	1,177	209	297	1,034	357	230	-	-	-	-
Wyoming	991	373	481	25	91	-	-	8	15	-	-	-

Table B-4.—State agency expenditures for research and development and R&D plant, by State and source of funds, fiscal year 1972

[Dollars in thousands]

State	Total research and development and R & D plant				Research and development				R & D plant			
	Total	Federal Government sources	State government sources	Other sources	Total	Federal Government sources	State government sources	Other sources	Total	Federal Government sources	State government sources	Other sources
Total	242,098	121,717	116,235	4,147	234,923	119,664	111,159	4,099	7,176	2,053	5,077	48
Alabama	1,323	986	282	35	1,323	986	282	55	-	-	-	-
Alaska	3,785	2,015	1,739	30	3,749	2,015	1,733	-	36	-	6	30
Arizona	2,974	2,251	656	66	2,966	2,244	656	66	8	6	-	-
Arkansas	1,506	1,228	209	69	1,503	1,226	208	69	3	2	1	-
California	31,942	19,339	11,828	775	30,780	18,954	11,052	775	1,162	385	777	-
Colorado	3,939	3,314	625	-	3,856	3,252	604	-	83	62	21	-
Connecticut	3,120	772	2,300	48	3,071	758	2,265	48	49	14	35	-
Delaware	209	143	66	-	209	143	66	-	-	-	-	-
Florida	9,708	5,451	4,257	-	9,640	5,441	4,199	-	69	10	58	-
Georgia	3,125	1,824	1,282	18	3,125	1,824	1,282	18	-	-	-	-
Hawaii	2,325	938	1,387	-	2,321	938	1,383	-	4	-	4	-
Idaho	1,271	430	841	-	1,271	430	841	-	-	-	-	-
Illinois	14,392	3,743	10,589	60	12,284	3,614	8,609	60	2,108	129	1,979	-
Indiana	4,250	3,344	904	2	4,250	3,344	904	2	-	-	-	-
Iowa	1,439	809	631	-	1,439	809	631	-	-	-	-	-
Kansas	1,201	851	342	8	1,192	851	333	8	10	-	10	-
Kentucky	3,815	2,261	1,516	39	3,812	2,257	1,516	39	4	4	-	-
Louisiana	3,007	1,410	594	3	1,764	1,229	533	3	243	182	61	-
Maine	2,116	856	1,258	2	1,827	786	1,039	2	289	70	219	-
Maryland	2,471	1,043	1,396	32	2,441	1,013	1,396	32	30	30	(a)	-
Massachusetts	3,610	2,256	1,144	210	3,600	2,256	1,134	210	10	-	10	-
Michigan	5,511	2,547	2,964	-	5,451	2,529	2,922	-	60	18	42	-
Minnesota	2,327	1,489	813	25	2,312	1,475	812	25	15	14	1	-
Mississippi	1,095	783	313	-	1,095	783	313	-	-	-	-	-
Missouri	1,759	1,162	596	-	1,753	1,162	591	-	6	-	6	-
Montana	703	640	64	-	996	634	62	-	7	6	2	-
Nebraska	392	227	165	-	392	227	165	-	-	-	-	-
Nevada	770	522	226	22	769	522	225	22	(a)	-	(a)	-
New Hampshire	1,092	527	540	25	192	77	90	25	900	450	450	-
New Jersey	3,647	2,223	1,370	94	3,606	2,167	1,351	87	82	56	19	7
New Mexico	478	668	211	-	478	668	211	-	-	-	-	-
New York	55,785	14,833	39,788	1,164	55,064	14,596	39,304	1,164	721	237	484	-
North Carolina	4,784	1,796	2,982	5	4,757	1,786	2,966	5	27	11	16	-
North Dakota	809	528	241	40	793	516	237	40	16	12	4	-
Ohio	3,782	2,294	1,488	-	3,548	2,060	1,484	-	234	234	-	-
Oklahoma	2,118	1,147	615	355	2,097	1,127	615	355	21	21	-	-
Oregon	3,326	2,587	557	193	3,326	2,587	557	193	-	-	-	-
Pennsylvania	9,697	4,860	4,825	12	9,289	4,842	4,435	12	408	18	389	-
Rhode Island	248	158	90	-	248	158	90	-	-	-	-	-
South Carolina	2,423	1,687	729	7	2,268	1,650	611	7	155	38	118	-
South Dakota	1,278	762	460	56	1,278	762	460	56	-	-	-	-
Tennessee	3,378	2,404	909	61	3,341	2,385	895	61	37	24	14	-
Texas	10,120	6,120	3,955	46	9,987	6,120	3,822	46	133	-	133	-
Utah	1,694	1,101	588	5	1,693	1,101	588	4	1	-	-	1
Vermont	1,493	1,402	70	20	1,483	1,402	70	10	10	-	-	10
Virginia	6,006	2,673	3,267	66	5,858	2,670	3,122	66	148	3	145	-
Washington	9,815	7,495	1,808	512	9,781	7,495	1,773	512	34	-	34	-
West Virginia	2,084	1,542	542	-	2,059	1,527	532	-	25	15	10	-
Wisconsin	3,732	1,961	1,939	33	3,732	1,961	1,939	33	-	-	-	-
Wyoming	786	408	377	-	756	408	348	-	29	-	29	-

(a) Less than $500.

Table B-5.—State agency expenditures for research and development and R&D plant, by State and source of funds, fiscal year 1973

[Dollars in thousands]

State	Total research and development and R & D plant				Research and development				R & D plant			
	Total	Federal Government sources	State government sources	Other sources	Total	Federal Government sources	State government sources	Other sources	Total	Federal Government sources	State government sources	Other sources
Total	273,371	136,780	131,177	5,415	263,778	133,564	125,518	4,695	9,595	3,215	5,659	721
Alabama	1,359	950	344	65	1,359	950	344	65	-	-	-	-
Alaska	4,097	2,134	1,953	9	4,072	2,134	1,937	-	25	-	16	9
Arizona	3,241	2,427	748	66	3,183	2,371	746	66	59	36	3	-
Arkansas	1,210	973	165	73	1,204	968	163	73	7	4	2	-
California	36,685	23,038	13,003	643	35,375	22,598	12,134	643	1,310	440	869	-
Colorado	5,332	4,532	800	-	5,224	4,451	773	-	108	81	27	-
Connecticut	3,077	749	2,289	39	3,032	749	2,244	39	46	-	46	-
Delaware	269	139	95	35	269	139	95	35	-	-	-	-
Florida	11,221	5,605	5,616	-	11,145	5,597	5,548	-	76	8	68	-
Georgia	3,360	2,014	1,255	91	3,300	2,014	1,195	91	60	-	60	-
Hawaii	2,375	1,226	1,150	-	2,371	1,226	1,146	-	4	-	4	-
Idaho	1,271	416	855	-	1,271	416	855	-	-	-	-	-
Illinois	12,647	4,039	8,564	45	12,250	3,952	8,262	45	389	87	301	-
Indiana	5,874	4,912	960	1	5,874	4,912	960	1	-	-	-	-
Iowa	1,679	859	820	-	1,679	859	820	-	-	-	-	-
Kansas	1,645	1,077	522	45	1,639	1,077	516	45	6	-	6	-
Kentucky	3,925	1,975	1,918	33	3,925	1,975	1,918	33	-	-	-	-
Louisiana	2,299	1,638	636	24	2,046	1,446	575	24	253	192	61	-
Maine	2,065	831	1,234	-	2,006	831	1,175	-	58	-	58	-
Maryland	3,193	1,557	1,612	24	3,165	1,529	1,612	24	27	27	-	-
Massachusetts	6,073	3,033	2,778	262	5,279	3,033	1,984	262	794	-	794	-
Michigan	6,865	3,046	3,794	25	6,829	3,025	3,779	25	36	21	15	-
Minnesota	2,859	1,269	1,546	43	2,849	1,260	1,545	43	10	9	1	-
Mississippi	1,257	900	357	-	1,190	851	339	-	67	49	18	-
Missouri	1,879	1,245	635	-	1,865	1,245	620	-	14	-	14	-
Montana	939	853	85	-	930	847	83	-	9	6	3	-
Nebraska	452	274	178	-	452	274	178	-	-	-	-	-
Nevada	935	658	250	26	934	658	250	26	(a)	-	(a)	-
New Hampshire	150	55	77	18	150	55	77	18	-	-	-	-
New Jersey	5,607	3,093	2,367	147	5,596	3,090	2,365	140	12	3	1	7
New Mexico	825	626	199	-	825	626	199	-	-	-	-	-
New York	65,471	18,410	45,274	1,787	60,330	16,565	42,682	1,083	5,141	1,844	2,593	704
North Carolina	5,290	2,098	3,191	1	5,262	2,079	3,181	1	28	19	9	-
North Dakota	841	551	253	37	818	534	247	37	23	17	6	-
Ohio	6,227	2,604	3,560	63	5,870	2,370	3,437	63	357	234	123	-
Oklahoma	2,277	1,187	620	470	2,277	1,187	620	470	-	-	-	-
Oregon	3,907	2,830	627	450	3,907	2,830	627	450	-	-	-	-
Pennsylvania	9,254	4,813	4,422	19	9,243	4,802	4,421	19	11	11	1	-
Rhode Island	292	196	91	5	292	196	91	5	-	-	-	-
South Carolina	2,149	1,186	962	1	1,994	1,148	945	1	155	38	116	-
South Dakota	1,308	788	463	56	1,308	788	463	56	-	-	-	-
Tennessee	3,261	2,336	900	25	3,199	2,287	887	25	62	49	13	-
Texas	10,837	6,380	4,420	37	10,704	6,380	4,287	37	133	-	133	-
Utah	1,637	1,057	575	5	1,636	1,057	575	4	1	-	-	1
Vermont	1,169	1,101	58	10	1,169	1,101	58	10	-	-	-	-
Virginia	7,121	3,027	3,979	115	6,856	3,024	3,717	115	265	3	262	-
Washington	10,655	8,135	1,945	375	10,635	8,135	1,926	575	20	-	20	-
West Virginia	2,232	1,541	691	-	2,207	1,529	679	-	24	12	12	-
Wisconsin	3,793	1,907	1,841	45	3,788	1,903	1,840	45	5	4	1	-
Wyoming	991	491	499	-	991	491	499	-	-	-	-	-

[a] Less than $500.

Table B-6.—State agency expenditures for research and development financed by Federal sources, by State and functional area, fiscal year 1972

[Dollars in thousands]

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	119,664	29,209	21,101	29,815	18,814	16,032	1,806	2,239	293	234	106	15
Alabama	986	109	63	669	145	-	-	-	-	-		-
Alaska	2,015	80	1,923	9	5	-	-	-	-	-	-	-
Arizona	2,244	-	230	-	1,877	106	-	30	-	-	-	-
Arkansas	1,226	-	86	455	130	381	-	174	-	-	-	-
California	18,954	8,941	1,126	5,338	2,905	134	54	352	-	40	65	-
Colorado	3,252	231	695	341	115	1,870	-	-	-	-	-	-
Connecticut	758	166	320	-	272	-	-	-	-	-	-	-
Delaware	143	-	90	53	-	-	-	-	-	-	-	-
Florida	5,441	2,382	762	863	235	1,070	-	-	130	-	-	-
Georgia	1,824	93	141	1,312	278	-	-	-	-	-	-	-
Hawaii	938	-	273	492	31	122	-	-	20	-	-	-
Idaho	430	-	425	-	6	-	-	-	-	-	-	-
Illinois	3,614	672	118	1,089	866	343	100	426	-	-	-	-
Indiana	3,344	188	94	108	280	2,674	-	-	-	-	-	-
Iowa	809	164	-	526	17	95	-	-	6	-	-	-
Kansas	851	90	47	575	98	-	16	26	-	-	-	-
Kentucky	2,257	100	166	896	250	583	223	-	39	-	-	-
Louisiana	1,228	-	605	-	592	-	31	-	-	-	-	-
Maine	786	16	481	134	74	-	81	-	-	-	-	-
Maryland	1,013	104	306	150	258	15	60	-	-	120	-	-
Massachusetts	2,256	850	317	459	300	51	24	254	-	-	-	-
Michigan	2,529	754	630	589	304	253	-	-	-	-	-	-
Minnesota	1,475	29	198	1,120	55	49	-	-	-	34	-	-
Mississippi	783	10	-	511	155	-	48	59	-	-	-	-
Missouri	1,162	-	547	367	228	-	-	-	-	21	-	-
Montana	634	-	487	36	11	-	40	60	-	-	-	-
Nebraska	227	-	109	-	117	-	-	-	-	-	-	-
Nevada	322	-	478	-	21	23	-	-	1	-	-	-
New Hampshire	77	-	69	-	8	-	-	-	-	-	-	-
New Jersey	2,167	459	160	615	934	-	-	-	-	-	-	-
New Mexico	668	-	562	-	35	-	70	-	-	-	-	-
New York	14,596	10,962	937	907	1,343	86	59	247	-	-	41	15
North Carolina	1,786	147	735	698	153	-	-	35	-	19	-	-
North Dakota	516	-	130	289	24	-	-	-	73	-	-	-
Ohio	2,060	246	254	714	678	168	-	-	-	-	-	-
Oklahoma	1,127	105	511	218	249	-	44	-	-	-	-	-
Oregon	2,587	-	678	1,841	46	-	-	-	21	-	-	(a)
Pennsylvania	4,842	512	90	1,225	1,914	621	480	9	-	-	-	-
Rhode Island	158	-	115	-	42	-	-	-	-	-	-	-
South Carolina	1,650	24	484	791	-	228	-	119	3	-	-	-
South Dakota	762	-	135	538	80	-	8	-	-	-	-	-
Tennessee	2,385	629	391	1,048	316	-	-	-	-	-	-	-
Texas	6,120	369	1,504	2,102	1,604	209	201	131	-	-	-	-
Utah	1,101	336	131	504	49	-	-	81	-	-	-	-
Vermont	1,402	112	94	-	3	1,161	-	43	-	-	-	-
Virginia	2,670	-	1,546	664	453	7	-	-	-	-	-	-
Washington	7,495	52	837	425	939	4,976	267	-	-	-	-	-
West Virginia	1,527	125	342	827	166	37	-	30	-	-	-	-
Wisconsin	1,861	78	510	277	59	772	-	164	-	-	-	-
Wyoming	408	76	199	42	92	-	-	-	-	-	-	-

[a] Less than $500.

Table B-7.—State agency expenditures for research and development financed by Federal sources, by State and functional areas, fiscal year 1973

[Dollars in thousands]

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	133,564	34,721	23,588	30,944	19,854	18,177	2,411	2,965	339	396	74	196
Alabama	950	109	80	669	80	12	-	-	-	-	-	-
Alaska	2,134	19	1,894	75	146	-	-	-	-	-	-	-
Arizona	2,371	144	220	-	1,830	102	-	75	-	-	-	-
Arkansas	968	-	82	421	101	239	-	124	2	-	-	-
California	22,599	11,533	1,225	6,313	2,833	135	89	360	-	40	70	-
Colorado	4,451	261	887	376	40	2,787	-	100	-	-	-	-
Connecticut	749	104	353	-	284	8	-	-	-	-	-	-
Delaware	139	-	86	53	-	-	-	-	-	-	-	-
Florida	5,597	2,608	910	664	169	1,135	-	-	111	-	-	-
Georgia	2,014	211	173	1,439	192	-	-	-	-	-	-	-
Hawaii	1,226	-	304	588	61	184	-	-	89	-	-	-
Idaho	416	-	408	-	8	-	-	-	-	-	-	-
Illinois	3,952	373	425	1,252	773	513	100	517	-	-	-	-
Indiana	4,912	265	74	109	415	4,050	-	-	-	-	-	-
Iowa	859	228	-	546	8	67	-	5	6	-	-	-
Kansas	1,077	98	34	495	126	290	6	29	-	-	-	-
Kentucky	1,975	117	165	677	250	470	262	-	34	-	-	-
Louisiana	1,446	-	631	-	599	-	107	-	-	-	-	109
Maine	931	4	449	126	74	-	137	-	-	-	-	-
Maryland	1,529	127	606	228	189	5	65	13	-	245	-	52
Massachusetts	3,033	1,342	335	621	335	-	41	339	-	-	-	-
Michigan	3,025	984	600	811	354	276	-	-	-	-	-	-
Minnesota	1,260	29	188	959	40	19	-	-	-	26	-	-
Mississippi	851	-	19	481	152	-	47	151	-	-	-	-
Missouri	1,245	-	548	448	167	-	-	-	-	81	-	-
Montana	847	15	559	30	45	-	119	80	-	-	-	-
Nebraska	274	-	123	-	104	-	-	45	2	-	-	-
Nevada	658	50	565	-	21	19	-	-	-	-	4	-
New Hampshire	55	-	55	-	-	-	-	-	-	-	-	-
New Jersey	3,090	401	160	627	1,643	138	121	-	-	-	-	-
New Mexico	626	-	540	-	36	-	49	-	-	-	-	-
New York	16,565	12,600	1,030	987	1,397	220	91	240	-	-	-	-
North Carolina	2,079	280	830	793	171	-	-	-	-	4	-	-
North Dakota	534	-	148	286	89	-	-	-	11	-	-	-
Ohio	2,370	72	583	708	747	260	-	-	-	-	-	-
Oklahoma	1,187	47	557	229	128	-	96	131	-	-	-	-
Oregon	2,830	-	715	1,867	116	-	73	-	23	-	-	36
Pennsylvania	4,802	468	141	796	2,427	479	473	19	-	-	-	-
Rhode Island	196	-	120	-	42	-	33	-	-	-	-	-
South Carolina	1,148	95	496	363	-	88	-	100	6	-	-	-
South Dakota	788	-	139	559	46	-	44	-	-	-	-	-
Tennessee	2,287	782	404	1,029	62	-	10	-	-	-	-	-
Texas	6,380	315	1,418	2,547	1,594	245	94	167	-	-	-	-
Utah	1,057	276	137	556	55	-	-	32	-	-	-	-
Vermont	1,101	123	111	-	3	797	-	67	-	-	-	-
Virginia	3,024	176	1,719	740	383	7	-	-	-	-	-	-
Washington	8,135	137	1,180	450	1,290	4,703	319	-	55	-	-	-
West Virginia	1,529	125	293	927	94	28	27	135	-	-	-	-
Wisconsin	1,903	131	510	186	55	902	9	110	-	-	-	-
Wyoming	491	73	319	13	79	-	-	8	-	-	-	-

Table B-8.—State agency expenditures for research and development financed by State government sources, by State and functional area, fiscal year 1972

[Dollars in thousands]

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	111,159	52,521	28,614	5,940	11,514	1,593	7,345	1,291	1,329	392	487	131
Alabama	282	21	84	105	48	-	23	-	-	-	-	-
Alaska	1,733	40	1,655	-	39	-	-	-	-	-	-	-
Arizona	656	-	442	-	204	-	-	10	-	-	-	-
Arkansas	208	-	102	14	-	39	-	53	-	-	-	-
California	11,052	1,160	4,608	-	1,952	13	2,423	813	-	82	-	-
Colorado	604	127	425	51	1	-	-	-	-	-	-	-
Connecticut	2,265	1,028	1,074	-	163	-	-	-	-	-	-	-
Delaware	66	-	48	17	-	-	-	-	-	-	-	-
Florida	4,199	1,552	1,033	-	1,212	284	-	-	118	-	-	-
Georgia	1,282	385	350	444	104	-	-	-	-	-	-	-
Hawaii	1,383	39	314	872	6	31	92	-	30	-	-	-
Idaho	841	-	799	-	5	-	20	-	16	-	-	-
Illinois	8,609	4,461	1,823	225	383	57	1,554	36	72	-	-	-
Indiana	904	316	215	23	350	-	-	-	-	-	-	-
Iowa	631	75	354	-	176	-	-	-	6	-	20	-
Kansas	333	24	80	-	214	9	5	-	-	-	-	-
Kentucky	1,516	-	475	46	460	63	74	-	398	-	-	-
Louisiana	533	149	222	10	148	-	4	-	-	-	-	-
Maine	1,039	19	822	37	61	12	85	2	-	-	-	-
Maryland	1,396	1,054	-	111	73	-	93	-	-	65	-	-
Massachusetts	1,134	226	326	69	115	11	387	-	-	-	-	-
Michigan	2,922	436	736	-	1,042	288	-	-	-	-	-	-
Minnesota	412	71	134	364	214	11	-	-	-	18	-	-
Mississippi	313	35	-	75	155	25	16	7	-	-	-	-
Missouri	591	5	434	-	89	-	63	-	-	-	-	-
Montana	62	2	57	-	3	-	-	-	-	-	-	-
Nebraska	165	-	93	-	57	-	-	-	14	-	-	-
Nevada	225	-	181	-	-	11	-	-	-	-	33	-
New Hampshire	90	-	53	-	2	-	34	-	-	-	-	-
New Jersey	1,351	397	68	-	687	-	-	-	-	200	-	-
New Mexico	211	-	196	-	25	-	-	-	-	-	-	-
New York	39,304	34,621	1,849	-	799	401	1,210	139	148	-	15	131
North Carolina	2,966	423	1,972	290	60	-	-	9	-	14	249	-
North Dakota	237	83	46	-	13	-	-	-	95	-	-	-
Ohio	1,488	714	224	237	261	42	-	-	10	-	-	-
Oklahoma	615	-	378	17	199	-	22	-	-	-	-	-
Oregon	557	-	513	-	21	-	-	-	23	-	-	-
Pennsylvania	4,435	2,755	314	593	166	139	308	3	-	-	167	-
Rhode Island	90	-	79	-	11	-	-	-	-	-	-	-
South Carolina	611	1	426	100	-	4	-	55	22	-	3	-
South Dakota	460	-	120	8	32	-	287	-	13	-	-	-
Tennessee	895	210	481	140	65	-	-	-	-	-	-	-
Texas	3,822	547	1,005	1,377	688	53	130	23	-	-	-	-
Utah	588	-	36	552	-	-	1	-	-	-	-	-
Vermont	70	-	29	-	10	-	-	32	-	-	-	-
Virginia	3,122	371	1,642	142	798	-	-	-	169	-	-	-
Washington	1,773	45	1,205	8	141	-	173	3	187	13	-	-
West Virginia	532	65	428	-	39	-	-	-	-	-	-	-
Wisconsin	1,439	399	640	25	225	100	340	109	-	-	-	-
Wyoming	312	264	65	-	11	-	-	-	8	-	-	-

Table B-9.—State agency expenditures for research and development financed by State government sources, by State and functional area, fiscal year 1973

[Dollars in thousands]

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	125,518	55,131	34,322	8,707	11,253	1,992	8,842	1,645	1,425	1,013	693	497
Alabama	341	22	100	105	71	-	46	-	-	-	-	-
Alaska	1,937	11	1,874	5	48	-	-	-	-	-	-	-
Arizona	746	10	394	-	316	-	-	25	-	-	-	-
Arkansas	163	-	84	18	-	11	-	50	-	-	-	-
California	12,134	618	6,496	346	1,298	14	2,076	1,068	50	116	52	-
Colorado	773	113	586	74	(a)	-	-	-	-	-	-	-
Connecticut	2,244	1,000	1,094	-	150	-	-	-	-	-	-	-
Delaware	95	-	48	47	-	-	-	-	-	-	-	-
Florida	5,548	1,868	1,548	-	1,396	532	20	-	183	-	-	-
Georgia	1,195	438	382	239	82	55	-	-	-	-	-	-
Hawaii	1,146	48	680	240	12	31	105	-	30	-	-	-
Idaho	855	-	822	-	15	-	7	-	11	-	-	-
Illinois	8,262	3,908	1,863	302	350	71	1,635	55	80	-	-	-
Indiana	960	359	212	37	352	-	-	-	-	-	-	-
Iowa	820	88	537	-	139	-	-	2	30	-	24	-
Kansas	516	27	98	-	258	36	97	-	-	-	-	-
Kentucky	1,918	5	691	20	650	93	91	-	367	-	-	-
Louisiana	575	168	230	10	150	-	17	-	-	-	-	-
Maine	1,175	18	896	71	61	9	117	3	-	-	-	-
Maryland	1,612	1,026	-	126	53	3	27	-	-	370	-	6
Massachusetts	1,984	398	393	72	125	-	995	-	-	-	-	-
Michigan	3,779	1,492	935	2	1,037	313	-	-	-	-	-	-
Minnesota	1,545	89	141	1,018	213	13	-	55	-	14	-	-
Mississippi	339	45	6	78	152	25	16	17	-	-	-	-
Missouri	620	50	407	10	65	-	86	-	-	3	-	-
Montana	83	20	61	-	2	-	-	-	-	-	-	-
Nebraska	178	-	98	-	34	-	-	12	28	6	-	-
Nevada	250	1	210	-	-	5	-	-	-	-	33	-
New Hampshire	77	-	52	-	-	-	24	-	-	-	-	-
New Jersey	2,365	344	72	-	469	19	961	-	-	500	-	-
New Mexico	199	-	175	-	24	-	-	-	-	-	-	-
New York	42,682	36,951	2,235	-	874	252	1,377	137	145	-	221	491
North Carolina	3,181	414	2,006	446	72	-	-	-	-	2	241	-
North Dakota	247	83	57	-	48	-	4	-	55	-	-	-
Ohio	3,437	664	334	2,077	287	65	-	-	10	-	-	-
Oklahoma	620	-	400	19	152	-	49	-	-	-	-	-
Oregon	627	-	537	-	40	-	15	-	34	-	-	-
Pennsylvania	4,321	2,952	468	554	95	150	86	6	-	-	110	-
Rhode Island	91	-	91	-	11	-	-	-	-	-	-	-
South Carolina	845	12	409	350	-	3	-	38	23	-	11	-
South Dakota	463	-	122	14	18	-	295	-	15	-	-	-
Tennessee	887	246	509	97	22	-	14	-	-	-	-	-
Texas	4,287	662	1,379	1,212	683	160	194	4	-	-	-	-
Utah	575	-	33	541	-	-	1	-	-	-	-	-
Vermont	58	-	33	-	3	-	2	20	-	-	-	-
Virginia	3,717	249	1,722	535	1,036	-	-	-	174	-	-	-
Washington	1,926	46	1,445	9	113	-	138	-	174	3	-	-
West Virginia	679	69	571	-	25	-	1	14	-	-	-	-
Wisconsin	1,840	315	640	22	242	133	349	140	-	-	-	-
Wyoming	499	300	162	10	12	-	-	(a)	15	-	-	-

[a] Less than $500.

Table B-10.—State agency expenditures for research and development, by State and field of science, fiscal year 1972

[Dollars in thousands]

State	Total	Biological sciences	Clinical medical sciences	Psychology	Physical sciences	Environmental sciences	Mathematics	Engineering	Social sciences	Other sciences
Total	234,923	75,134	35,957	16,022	5,396	11,021	1,603	29,143	58,008	2,639
Alabama	1,323	177	-	100	-	78	-	193	774	-
Alaska	3,749	3,540	-	9	-	-	-	81	119	-
Arizona	2,966	271	-	-	-	291	-	2,106	298	-
Arkansas	1,503	188	-	420	-	11	79	188	617	-
California	30,790	5,316	8,167	6,257	2,452	1,554	396	4,387	1,839	413
Colorado	3,856	1,061	-	358	-	-	-	140	2,297	-
Connecticut	3,071	1,945	539	153	-	[illegible]	-	435	-	-
Delaware	209	138	-	70	-	-	-	-	-	-
Florida	9,640	2,322	1,250	177	-	130	-	1,483	4,277	-
Georgia	3,125	202	134	199	-	441	-	417	1,729	4
Hawaii	2,321	320	39	-	-	222	-	70	1,671	-
Idaho	1,271	1,211	-	-	21	2	-	20	18	-
Illinois	12,284	2,902	1,728	1,354	386	1,292	-	1,437	3,186	-
Indiana	4,250	408	241	167	-	-	-	630	2,804	-
Iowa	1,439	367	334	-	-	-	-	193	546	-
Kansas	1,192	38	-	24	-	1	-	421	132	575
Kentucky	3,812	288	-	-	-	419	-	992	2,112	-
Louisiana	1,764	909	-	28	-	35	-	740	-	51
Maine	1,827	1,502	-	1	-	5	-	135	183	2
Maryland	2,441	527	360	256	201	308	-	313	476	-
Massachusetts	3,600	1,165	361	676	-	253	-	362	726	56
Michigan	5,451	1,508	864	452	-	-	177	1,346	1,104	-
Minnesota	2,312	276	69	-	-	-	-	265	1,629	74
Mississippi	1,095	71	-	37	-	-	-	311	677	-
Missouri	1,753	971	-	5	-	49	7	333	388	-
Montana	696	536	-	-	12	40	-	10	62	36
Nebraska	392	282	-	-	-	-	-	95	15	-
Nevada	769	661	-	34	-	-	-	43	32	-
New Hampshire	192	182	-	-	10	-	-	-	-	-
New Jersey	3,606	275	632	190	69	1	-	578	815	1,046
New Mexico	878	818	-	-	-	-	-	60	-	-
New York	55,064	26,003	17,621	1,407	1,938	1,568	893	2,090	3,414	130
North Carolina	4,757	2,471	162	456	117	303	-	228	1,021	-
North Dakota	793	173	123	-	-	3	-	37	457	-
Ohio	3,548	645	34	298	-	202	-	939	1,430	-
Oklahoma	2,097	615	460	-	177	472	-	139	235	-
Oregon	3,326	1,191	-	-	-	(a)	-	250	1,885	-
Pennsylvania	9,289	1,515	1,010	422	-	-	-	3,012	3,243	87
Rhode Island	248	195	-	-	-	-	-	53	-	-
South Carolina	2,268	367	24	177	-	37	-	-	1,662	-
South Dakota	1,278	181	-	-	-	414	-	119	565	-
Tennessee	3,341	1,544	60	50	-	118	-	381	1,188	-
Texas	9,987	3,221	148	102	-	331	-	2,292	3,836	58
Utah	1,693	171	336	1,056	13	-	-	36	81	-
Vermont	1,483	113	112	-	-	-	-	23	1,235	-
Virginia	5,858	2,199	327	44	-	1,185	51	689	1,257	107
Washington	9,781	2,327	276	603	-	395	-	482	5,698	-
West Virginia	2,058	573	40	156	-	196	-	204	894	-
Wisconsin	3,732	1,600	169	291	-	656	-	284	1,332	-
Wyoming	756	254	340	-	-	10	-	103	50	-

[a] Less than $500.

Table B-11.—State agency expenditures for research and development, by State and field of science, fiscal year 1973

[Dollars in thousands]

State	Total	Biological sciences	Clinical medical sciences	Psychology	Physical sciences	Environmental sciences	Mathematics	Engineering	Social sciences	Other sciences
Total	263,778	83,280	38,123	18,655	7,065	13,851	1,860	30,456	67,145	3,341
Alabama	1,359	212	-	100	-	111	-	151	786	-
Alaska	4,072	3,731	-	68	-	-	-	231	30	13
Arizona	3,183	233	144	10	-	280	-	2,206	244	65
Arkansas	1,204	166	112	139	-	12	124	142	491	18
California	35,375	6,564	9,117	7,822	3,617	1,091	293	3,900	2,278	693
Colorado	5,224	1,350	-	374	-	-	-	80	3,420	-
Connecticut	3,032	1,850	567	158	-	-	-	434	23	-
Delaware	269	134	-	100	-	35	-	-	-	-
Florida	11,145	2,699	1,309	189	-	144	-	1,940	4,863	-
Georgia	3,300	398	150	210	-	442	-	353	1,743	4
Hawaii	2,371	300	41	7	-	245	-	105	1,674	-
Idaho	1,271	1,205	-	-	23	-	-	32	11	-
Illinois	12,259	3,122	1,135	1,350	399	1,372	-	1,311	3,571	-
Indiana	5,874	382	330	199	-	-	-	630	4,332	-
Iowa	1,679	401	351	7	-	148	-	146	626	-
Kansas	1,639	31	-	22	95	-	-	492	503	495
Kentucky	3,925	281	-	-	185	451	-	1,236	1,772	-
Louisiana	2,046	948	-	104	-	124	-	748	70	51
Maine	2,006	1,605	-	1	-	58	-	135	204	3
Maryland	3,165	809	344	275	185	727	-	223	602	-
Massachusetts	5,279	1,465	450	854	-	430	-	827	1,209	43
Michigan	6,429	2,064	1,207	297	-	-	407	1,479	1,376	-
Minnesota	2,849	284	68	-	-	-	-	245	2,153	99
Mississippi	1,190	96	-	37	-	-	-	305	752	-
Missouri	1,865	976	-	11	-	60	-	237	582	-
Montana	930	567	-	-	8	152	-	19	154	30
Nebraska	452	280	-	-	-	-	-	79	93	-
Nevada	934	777	51	22	-	-	-	43	41	-
New Hampshire	150	137	-	-	13	-	-	-	-	-
New Jersey	5,596	267	506	216	79	1,085	-	651	1,284	1,507
New Mexico	825	765	-	-	-	-	-	60	-	-
New York	60,330	27,879	18,414	1,668	2,152	2,049	977	2,512	4,520	160
North Carolina	5,262	2,653	171	593	120	303	-	245	1,177	-
North Dakota	818	197	120	-	15	6	-	137	343	-
Ohio	5,870	1,195	35	313	-	172	-	1,034	3,120	-
Oklahoma	2,277	661	517	-	144	562	-	13	380	-
Oregon	3,907	1,252	-	-	-	36	-	694	1,925	-
Pennsylvania	9,243	1,839	938	529	-	-	-	3,082	2,774	80
Rhode Island	292	201	5	-	-	33	-	53	-	-
South Carolina	1,994	481	42	88	-	37	-	-	1,346	-
South Dakota	1,308	186	-	-	-	414	-	92	616	-
Tennessee	3,199	1,620	174	46	-	126	-	103	1,131	-
Texas	10,704	3,462	200	129	16	288	-	2,277	4,331	-
Utah	1,636	175	276	1,097	14	-	-	42	32	-
Vermont	1,169	128	123	-	-	-	-	13	906	-
Virginia	6,856	2,309	279	146	-	1,390	61	817	1,775	80
Washington	10,635	2,967	343	1,047	-	396	-	337	5,546	-
West Virginia	2,207	583	40	153	-	305	-	177	949	-
Wisconsin	3,788	1,009	192	274	-	656	-	297	1,360	-
Wyoming	991	385	373	-	-	111	-	91	31	-

Table B-12.—State agency expenditures for research and development, by State and performer subcategories, fiscal year 1972

[Dollars in thousands]

State	Total	Performed by sponsor or agency	Contracts to universities and colleges				Contracts to other performers				
			Total	State	Local public	Private	Total	Private firms or individuals	Private nonprofit organizations	Other State agencies[a]	Other governmental agencies[b]
Total.....	234,923	157,491	29,160	25,317	1,047	2,796	48,273	12,734	4,217	2,964	28,358
Alabama.....	1,323	327	127	116	10	-	869	-	-	-	869
Alaska.....	3,749	3,572	35	35	-	-	142	104	-	-	38
Arizona.....	2,966	741	1,096	1,096	-	-	1,129	809	-	29	291
Arkansas.....	1,503	707	387	338	50	-	409	148	-	-	261
California.....	30,780	20,284	2,553	2,430	123	-	7,944	2,605	230	384	4,725
Colorado.....	3,856	1,531	302	73	229	-	2,023	-	1,870	6	147
Connecticut.....	3,071	2,675	250	48	-	202	146	-	79	-	67
Delaware.....	209	124	27	27	-	-	57	8	37	-	13
Florida.....	9,640	7,987	818	818	-	-	835	130	-	150	555
Georgia.....	3,125	1,060	1,141	1,046	-	95	924	92	-	-	832
Hawaii.....	2,321	2,137	138	138	-	-	47	-	-	-	47
Idaho.....	1,271	1,009	193	191	2	-	70	-	20	-	50
Illinois.....	12,284	9,091	1,383	1,293	-	90	1,810	127	130	489	1,064
Indiana.....	4,250	911	3,339	3,339	-	-	-	-	-	-	-
Iowa.....	1,439	742	460	334	118	8	238	-	-	-	238
Kansas.....	1,192	453	162	129	33	-	576	34	-	-	542
Kentucky.....	3,812	2,261	277	277	-	-	1,273	453	-	801	20
Louisiana.....	1,764	1,378	209	205	-	4	177	-	34	-	143
Maine.....	1,827	1,623	57	57	-	-	147	-	101	(c)	46
Maryland.....	2,441	1,876	322	322	-	-	243	85	-	-	158
Massachusetts...	3,600	2,006	443	95	-	348	1,151	404	274	28	445
Michigan.....	5,451	4,852	65	65	-	-	534	50	30	-	454
Minnesota.....	2,312	773	78	62	-	16	1,462	30	-	-	1,432
Mississippi.....	1,095	499	55	55	-	-	541	-	-	10	531
Missouri.....	1,753	1,148	141	126	-	14	464	32	25	-	406
Montana.....	696	612	72	72	-	-	12	12	-	-	-
Nebraska.....	392	194	163	163	-	-	35	25	5	5	-
Nevada.....	769	686	40	40	-	-	43	-	-	-	43
New Hampshire...	192	182	10	10	-	-	-	-	-	-	-
New Jersey.....	3,606	1,677	81	56	-	25	1,848	1,033	200	-	615
New Mexico.....	878	798	20	20	-	-	60	-	-	-	60
New York.....	55,064	51,418	2,119	741	55	1,323	1,527	288	365	13	861
North Carolina..	4,757	1,930	1,835	1,811	-	24	992	73	204	1	713
North Dakota....	793	462	150	141	6	3	181	2	-	-	179
Ohio.....	3,548	1,802	703	703	-	-	1,043	143	-	-	900
Oklahoma.....	2,097	1,490	273	273	-	-	335	6	-	106	223
Oregon.....	3,326	1,243	77	77	-	-	2,006	176	-	-	1,830
Pennsylvania....	9,289	4,681	3,545	3,010	-	535	1,063	396	247	203	216
Rhode Island....	248	182	56	56	-	-	10	-	-	-	10
South Carolina..	2,268	988	70	70	-	-	1,210	115	-	74	1,021
South Dakota....	1,278	586	59	59	-	-	633	8	-	-	625
Tennessee.....	3,341	1,594	623	623	-	-	1,124	10	6	-	1,108
Texas.....	9,987	4,286	2,472	2,160	312	-	3,229	35	66	-	3,128
Utah.....	1,693	705	75	74	-	1	913	19	16	10	868
Vermont.....	1,483	589	47	32	-	15	847	136	197	305	209
Virginia.....	5,858	4,862	442	442	-	-	554	20	-	178	356
Washington.....	9,781	2,468	1,579	1,470	108	-	5,734	4,931	70	94	639
West Virginia...	2,058	1,004	30	30	-	-	1,024	161	-	-	863
Wisconsin.....	3,732	2,679	521	428	-	94	532	-	10	78	445
Wyoming.....	756	606	43	43	-	-	108	32	-	-	76

[a] Within the same State.
[b] Federal, local, and multigovernmental agencies, and agencies of other States.
[c] Less than $500.

Table B-13.—State agency expenditures for research and development, by State and performer subcategories, fiscal year 1973

[Dollars in thousands]

State	Total	Performed by sponsor or agency	Contracts to universities and colleges				Contracts to other performers				
			Total	State	Local public	Private	Total	Private firms or individuals	Private nonprofit organizations	Other State agencies [a]	Other government agencies [b]
Total.....	263,778	175,134	32,953	28,485	787	3,682	55,690	14,301	5,954	2,948	32,487
Alabama.....	1,359	407	83	73	10	-	869	-	-	-	869
Alaska.....	4,072	3,931	41	41	-	-	100	63	-	-	38
Arizona.....	3,183	851	1,087	1,087	-	-	1,245	913	-	53	280
Arkansas.....	1,204	426	362	357	5	-	415	107	-	-	308
California.....	35,375	23,808	3,521	3,227	207	87	8,047	2,251	107	215	5,474
Colorado.....	5,224	1,789	122	82	40	-	3,313	-	2,787	35	491
Connecticut.....	3,032	2,698	223	32	-	192	110	-	110	-	-
Delaware.....	269	165	25	25	-	-	78	6	60	-	13
Florida.....	11,145	9,238	1,251	1,251	-	-	656	164	-	150	341
Georgia.....	3,300	1,429	923	826	-	97	947	49	53	15	831
Hawaii.....	2,371	1,860	120	120	-	-	391	40	305	-	46
Idaho.....	1,271	1,018	210	208	2	-	44	-	7	-	37
Illinois.....	12,259	8,788	1,356	1,265	-	91	2,115	115	230	546	1,224
Indiana.....	5,874	1,014	4,715	4,715	-	-	145	-	-	-	145
Iowa.....	1,679	975	438	313	118	7	267	24	-	5	238
Kansas.....	1,639	617	201	201	-	-	821	184	44	3	590
Kentucky.....	3,925	2,117	336	336	-	-	1,473	462	23	948	20
Louisiana.....	2,046	1,506	285	220	-	65	255	25	120	-	109
Maine.....	2,006	1,661	158	152	6	-	188	-	150	-	38
Maryland.....	3,165	2,295	394	288	-	106	476	353	-	-	123
Massachusetts...	5,279	2,657	999	437	20	541	1,623	674	362	10	577
Michigan.....	6,829	5,750	451	451	-	-	628	22	30	-	576
Minnesota.....	2,849	840	81	81	-	-	1,928	6	-	-	1,922
Mississippi.....	1,190	582	57	57	-	-	551	63	-	-	488
Missouri.....	1,865	1,163	207	207	-	-	494	7	25	73	389
Montana.....	930	711	166	166	-	-	53	38	-	15	-
Nebraska.....	452	232	155	155	-	-	66	7	5	53	-
Nevada.....	934	851	40	40	-	-	43	-	-	-	43
New Hampshire...	150	137	-	-	-	-	13	-	-	-	13
New Jersey.....	5,596	2,502	81	56	-	25	3,012	1,885	500	-	627
New Mexico.....	825	740	25	25	-	-	60	-	-	-	60
New York.....	60,330	55,911	2,611	804	13	1,794	1,808	516	407	14	870
North Carolina..	5,262	2,671	1,453	1,427	-	26	1,138	-	92	-	1,046
North Dakota....	818	423	160	160	-	-	235	3	-	-	232
Ohio.....	5,870	2,000	930	927		3	2,940	154	-	7	2,779
Oklahoma.....	2,277	1,646	322	322	-	-	309	17	-	50	243
Oregon.....	3,907	1,439	205	119	-	86	2,262	443	-	-	1,819
Pennsylvania....	9,243	5,131	3,430	2,897	-	533	681	456	30	30	165
Rhode Island....	292	193	89	89	-	-	10	-	-	-	10
South Carolina..	1,994	952	80	80	-	-	962	72	-	117	773
South Dakota....	1,308	636	40	40	-	-	631	36	1	-	595
Tennessee.....	3,199	1,686	411	392	-	19	1,103	10	6	-	1,087
Texas.....	10,704	4,540	3,011	2,701	311	-	3,152	26	159	35	2,932
Utah.....	1,636	661	54	53	-	1	922	17	21	9	875
Vermont.....	1,169	582	73	63	-	10	514	112	134	173	94
Virginia.....	6,856	5,423	379	379	-	-	1,054	32	6	155	862
Washington.....	10,635	8,577	1,162	1,108	55	-	5,897	4,727	171	139	859
West Virginia...	2,207	1,080	94	94	-	-	1,034	167	-	-	867
Wisconsin.....	3,788	3,050	245	245	-	-	494	-	10	97	386
Wyoming.....	991	777	93	93	-	-	120	37	-	-	84

[a] Within the same States.

[b] Federal, local, and multigovernmental agencies, and agencies of other States.

Table B-14.—Full-time-equivalent personnel engaged in research and development in State agencies, by State and type of personnel, fiscal years 1972 and 1973

State	Total		Scientists and engineers		Technicians		Other[a]	
	1972	1973	1972	1973	1972	1973	1972	1973
Total	10,797.6	11,513.9	4,610.4	4,898.9	3,094.1	3,308.4	3,093.1	3,306.6
Alabama	25.9	29.0	14.6	15.9	4.6	5.3	6.7	7.8
Alaska	135.4	147.0	75.7	81.6	37.9	43.9	21.8	21.5
Arizona	39.6	41.9	17.5	18.4	10.7	11.0	11.4	15.5
Arkansas	43.4	30.1	26.4	13.3	7.5	9.1	9.5	7.7
California	1,333.4	1,429.5	643.6	694.5	350.2	380.1	339.6	354.9
Colorado	103.4	110.5	57.6	60.4	11.9	16.1	33.9	34.0
Connecticut	196.3	199.3	76.7	82.0	89.9	86.8	29.7	30.5
Delaware	11.4	13.6	9.2	9.8	-	1.0	2.2	2.8
Florida	555.6	610.8	315.1	363.6	118.5	114.0	122.0	133.2
Georgia	87.7	98.6	54.8	60.9	19.5	22.9	13.4	14.8
Hawaii	100.7	99.7	79.8	65.3	12.5	17.1	8.4	17.3
Idaho	31.2	31.8	28.6	28.5	0.3	1.0	2.3	2.3
Illinois	696.8	660.4	327.9	301.6	254.6	267.0	114.3	91.8
Indiana	82.0	90.4	33.7	33.6	5.6	6.2	42.7	50.6
Iowa	75.5	74.3	28.4	22.0	12.6	14.9	34.5	37.4
Kansas	43.2	52.6	15.8	19.2	22.5	22.8	4.9	10.6
Kentucky	187.0	154.1	94.7	74.0	43.8	37.7	48.5	42.4
Louisiana	96.7	108.0	46.6	51.5	28.8	28.8	21.3	27.7
Maine	120.6	128.4	59.5	62.3	30.6	34.4	30.5	31.7
Maryland	123.6	150.1	74.9	87.4	24.5	36.9	24.2	25.8
Massachusetts	135.4	166.2	79.4	99.0	24.1	26.9	31.9	40.3
Michigan	254.3	278.9	119.1	125.4	73.0	86.1	62.2	67.4
Minnesota	59.8	62.9	33.8	33.9	16.5	17.6	9.5	11.4
Mississippi	59.3	67.8	27.0	30.5	20.3	23.3	12.0	14.0
Missouri	85.2	82.0	36.2	33.3	27.3	25.8	21.7	22.9
Montana	51.7	59.0	34.5	37.4	11.5	13.6	5.7	8.0
Nebraska	13.9	19.8	9.2	11.9	3.2	3.5	1.5	4.4
Nevada	35.9	41.1	30.7	36.5	2.2	2.4	3.0	2.2
New Hampshire	9.2	8.4	5.5	4.5	2.9	3.2	0.8	0.7
New Jersey	138.9	139.7	70.9	80.8	32.5	25.3	35.5	33.6
New Mexico	43.0	43.0	27.0	27.0	7.0	7.0	9.0	9.0
New York	3,303.7	3,607.0	876.9	950.6	1,091.9	1,174.9	1,334.9	1,481.5
North Carolina	134.5	145.3	60.2	60.8	40.8	44.0	33.5	40.5
North Dakota	32.7	32.2	15.3	17.8	4.0	4.0	13.4	10.4
Ohio	131.4	158.6	73.5	90.8	26.8	32.8	31.1	35.0
Oklahoma	103.9	112.2	43.4	44.1	33.4	34.5	27.1	33.6
Oregon	72.4	78.9	49.7	55.1	14.7	17.0	8.0	6.8
Pennsylvania	297.7	311.0	141.1	138.0	94.9	109.4	61.7	63.6
Rhode Island	7.5	7.9	5.5	5.6	1.0	1.3	1.0	1.0
South Carolina	89.9	84.7	31.5	30.4	28.9	29.6	29.5	24.7
South Dakota	33.6	37.6	29.5	32.0	1.0	2.5	3.1	3.1
Tennessee	109.7	107.6	62.9	61.4	20.6	22.5	26.2	23.7
Texas	386.2	385.9	137.7	134.9	140.0	147.6	108.5	103.4
Utah	56.0	59.1	36.6	37.4	11.3	12.4	8.1	9.3
Vermont	52.5	50.3	11.0	16.2	-	-	41.5	34.1
Virginia	450.0	499.0	204.1	246.2	119.9	118.6	126.0	134.2
Washington	203.8	235.2	97.8	117.6	46.7	52.1	59.3	65.5
West Virginia	110.5	117.3	32.3	38.0	48.4	47.4	29.8	31.9
Wisconsin	204.9	207.1	125.1	130.0	46.8	49.8	33.0	27.3
Wyoming	40.7	45.1	21.9	26.0	16.0	16.3	2.8	2.8

[a] Includes typists, clerks, and personnel engaged in administration of research and development.

Table B-15.—Full-time-equivalent number of scientists and engineers engaged in research and development in State agencies, by State and functional area, fiscal year 1972

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	4,610.4	1,702.4	1,706.6	234.7	454.3	216.6	133.2	69.4	80.9	8.5	5.6	18.2
Alabama	14.6	9.0	3.6	-	0.5	-	1.5	-	-	-	-	-
Alaska	75.7	-	74.0	0.3	1.4	-	-	-	-	-	-	-
Arizona	17.5	-	9.0	-	7.0	-	-	1.5	-	-	-	-
Arkansas	26.4	-	0.3	2.0	5.1	17.0	-	2.0	-	-	-	-
California	643.6	253.8	297.6	15.6	29.8	1.0	15.7	26.6	-	2.5	1.0	-
Colorado	57.5	11.0	39.0	1.0	6.6	-	-	-	-	-	-	-
Connecticut	76.7	9.1	58.4	-	9.2	-	-	-	-	-	-	-
Delaware	9.2	-	8.1	1.1	-	-	-	-	-	-	-	-
Florida	315.1	149.0	56.9	-	33.2	65.0	-	-	11.0	-	-	-
Georgia	54.8	4.5	29.5	8.4	12.4	-	-	-	-	-	-	-
Hawaii	79.8	1.8	16.5	54.5	0.6	5.2	-	-	1.2	-	-	-
Idaho	28.6	-	27.0	-	0.2	-	-	-	1.4	-	-	-
Illinois	327.9	160.6	65.3	13.8	23.0	22.5	38.7	1.0	3.0	-	-	-
Indiana	33.7	-	16.0	-	-	-	-	-	-	-	-	17.7
Iowa	28.4	2.7	9.0	0.4	2.3	13.0	-	-	1.0	-	-	-
Kansas	15.8	2.0	0.7	-	9.8	1.0	2.3	-	-	-	-	-
Kentucky	94.7	8.0	8.3	34.4	22.0	6.0	1.0	-	15.0	-	-	-
Louisiana	46.6	4.3	32.2	0.5	9.5	-	0.1	-	-	-	-	-
Maine	59.5	1.0	46.8	1.8	4.0	0.9	5.0	-	-	-	-	-
Maryland	74.9	47.1	16.5	-	6.3	-	2.0	-	-	3.0	-	-
Massachusetts	79.4	30.3	28.3	4.5	1.8	5.0	7.5	2.0	-	-	-	-
Michigan	119.1	42.5	41.0	1.0	9.5	25.0	-	-	-	-	-	-
Minnesota	33.8	4.1	18.0	2.3	7.2	2.2	-	-	-	-	-	-
Mississippi	27.0	3.0	-	8.0	12.0	2.0	2.0	-	-	-	-	-
Missouri	36.2	0.2	28.9	-	4.1	-	3.0	-	-	-	-	-
Montana	34.5	0.1	31.6	-	0.7	-	0.1	2.0	-	-	-	-
Nebraska	9.2	-	8.1	-	0.2	-	-	-	0.9	-	-	-
Nevada	30.7	-	26.0	-	-	0.5	-	-	-	-	4.2	-
New Hampshire	5.5	-	3.7	-	-	-	1.8	-	-	-	-	-
New Jersey	70.9	26.4	13.6	-	30.9	-	-	-	-	-	-	-
New Mexico	27.0	-	27.0	-	-	-	-	-	-	-	-	-
New York	876.9	691.8	69.0	10.2	57.7	13.0	19.5	10.2	5.0	-	-	0.5
North Carolina	60.2	7.9	45.4	2.0	1.0	-	-	2.0	-	1.9	-	-
North Dakota	15.3	2.3	13.0	-	-	-	-	-	-	-	-	-
Ohio	73.5	40.8	22.5	3.1	4.5	2.0	-	-	0.6	-	-	-
Oklahoma	43.4	4.0	23.6	7.5	7.5	-	0.8	-	-	-	-	-
Oregon	49.7	-	45.5	-	1.4	-	-	-	2.8	-	-	-
Pennsylvania	141.1	76.7	9.3	33.4	17.0	-	3.9	0.8	-	-	-	-
Rhode Island	5.5	-	5.5	-	-	-	-	-	-	-	-	-
South Carolina	31.5	-	21.2	5.0	-	1.3	-	2.1	1.5	-	0.4	-
South Dakota	29.5	-	14.5	0.8	2.0	-	12.2	-	-	-	-	-
Tennessee	62.9	26.3	31.2	5.4	-	-	-	-	-	-	-	-
Texas	137.7	20.5	91.1	3.0	7.0	2.5	5.0	8.6	-	-	-	-
Utah	36.6	14.0	12.1	7.0	3.2	-	0.3	-	-	-	-	-
Vermont	11.0	-	8.0	-	-	-	-	3.0	-	-	-	-
Virginia	204.1	7.7	93.5	6.4	86.9	-	-	-	9.5	-	-	-
Washington	97.8	5.5	65.2	-	8.0	-	0.8	0.2	7.0	1.1	-	-
West Virginia	32.3	5.0	26.0	-	1.3	-	-	-	-	-	-	-
Wisconsin	125.1	24.9	43.0	1.3	7.0	31.5	10.0	7.4	-	-	-	-
Wyoming	21.9	4.5	16.0	-	0.4	-	-	-	1.0	-	-	-

Table B-16.—Full-time-equivalent number of scientists and engineers engaged in research and development in State agencies, by State and functional area, fiscal year 1973

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	4,898.9	1,812.4	1,842.2	206.1	476.9	205.1	145.3	103.6	67.3	13.4	7.2	19.4
Alabama	15.9	9.0	3.6	-	0.5	0.5	2.3	-	-	-	-	-
Alaska	81.6	-	73.5	0.5	7.6	-	-	-	-	-	-	-
Arizona	18.4	0.4	8.0	-	8.5	-	-	1.5	-	-	-	-
Arkansas	13.3	-	0.3	1.5	3.0	7.0	-	1.0	-	-	-	0.5
California	694.5	279.0	298.1	27.2	34.5	1.0	11.1	37.6	-	4.0	2.0	-
Colorado	60.4	10.0	46.5	1.0	2.9	-	-	-	-	-	-	-
Connecticut	82.0	10.1	61.5	-	10.4	-	-	-	-	-	-	-
Delaware	9.8	-	8.3	1.5	-	-	-	-	-	-	-	-
Florida	353.6	139.0	66.1	-	34.5	83.0	-	-	11.0	-	-	-
Georgia	60.9	10.0	31.5	8.9	7.4	3.1	-	-	-	-	-	-
Hawaii	65.3	2.0	15.7	33.1	0.8	7.8	0.6	-	5.3	-	-	-
Idaho	28.5	-	27.0	-	0.5	-	-	-	1.0	-	-	-
Illinois	301.6	131.2	67.3	13.1	21.0	24.9	38.7	2.0	3.4	-	-	-
Indiana	33.6	-	16.0	-	0	-	-	-	-	-	-	17.4
Iowa	22.0	3.2	11.9	0.4	2.3	3.0	-	0.2	1.0	-	-	-
Kansas	19.2	2.0	1.1	-	11.1	4.0	1.0	-	-	-	-	-
Kentucky	74.0	4.5	8.5	17.0	24.0	4.0	1.0	-	15.0	-	-	-
Louisiana	51.5	7.6	34.7	0.5	8.4	-	0.3	-	-	-	-	-
Maine	62.3	1.0	49.8	1.8	4.0	0.5	5.2	-	-	-	-	-
Maryland	87.4	44.3	28.5	-	4.6	-	2.0	-	-	8.0	-	-
Massachusetts	99.0	52.2	29.3	4.3	3.2	-	8.0	2.0	-	-	-	-
Michigan	125.4	47.2	41.0	-	11.0	-	-	25.0	1.2	-	-	-
Minnesota	33.9	4.9	18.0	2.3	7.4	1.3	-	-	-	-	-	-
Mississippi	30.5	4.2	2.3	8.0	12.0	2.0	2.0	-	-	-	-	-
Missouri	33.3	0.4	26.6	-	3.0	-	3.0	-	-	0.3	-	-
Montana	37.4	1.0	32.7	-	1.5	-	0.2	2.0	-	-	-	-
Nebraska	11.9	-	9.2	-	0.3	-	-	0.1	2.0	0.3	-	-
Nevada	36.5	3.0	28.0	-	-	0.6	-	-	-	-	4.9	-
New Hampshire	4.5	-	3.2	-	-	-	1.3	-	-	-	-	-
New Jersey	80.8	22.9	13.4	-	28.0	11.5	5.0	-	-	-	-	-
New Mexico	27.0	-	27.0	-	-	-	-	-	-	-	-	-
New York	950.6	757.7	78.0	10.2	56.8	9.0	24.5	9.2	5.0	-	-	0.2
North Carolina	60.8	9.1	46.7	3.6	1.0	-	-	-	-	0.4	-	-
North Dakota	17.8	2.3	13.5	-	2.0	-	-	-	-	-	-	-
Ohio	90.8	31.7	48.7	2.5	4.8	2.5	-	-	0.6	-	-	-
Oklahoma	44.1	4.0	25.8	8.0	4.5	-	1.8	-	-	-	-	-
Oregon	55.1	-	48.3	-	2.7	-	-	-	2.8	-	-	1.3
Pennsylvania	138.0	73.9	10.3	31.2	20.0	-	1.8	0.8	-	-	-	-
Rhode Island	5.6	0.1	5.5	-	-	-	-	-	-	-	-	-
South Carolina	30.4	-	21.7	5.0	-	0.1	-	1.8	1.5	-	0.3	-
South Dakota	32.0	-	14.5	2.0	3.0	-	12.5	-	-	-	-	-
Tennessee	61.4	25.5	32.1	3.8	-	-	-	-	-	-	-	-
Texas	134.9	19.2	93.1	3.0	7.0	2.9	3.2	6.5	-	-	-	-
Utah	37.4	13.2	13.3	7.3	3.3	-	0.3	-	-	-	-	-
Vermont	16.2	-	11.0	-	-	-	0.2	5.0	-	-	-	-
Virginia	246.2	14.7	113.1	6.2	102.7	-	-	-	9.5	-	-	-
Washington	117.6	10.9	83.9	1.0	8.7	0.4	4.3	-	8.0	0.4	-	-
West Virginia	38.0	5.1	29.1	-	0.3	-	3.5	-	-	-	-	-
Wisconsin	130.0	22.4	43.0	1.2	7.0	36.0	11.5	8.9	-	-	-	-
Wyoming	26.0	3.5	22.0	-	0.5	-	-	-	-	-	-	-

Table B-17.—Full-time-equivalent number of technicians engaged in research and development in State agencies, by State and functional area, fiscal year 1972

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	3,094.1	1,700.3	729.6	21.6	441.5	52.1	116.7	14.3	13.2	2.0	1.2	1.6
Alabama	4.6	-	4.3	-	-	-	0.3	-	-	-	-	-
Alaska	37.9	0.9	37.0	-	-	-	-	-	-	-	-	-
Arizona	10.7	-	4.0	-	1.7	5.0	-	-	-	-	-	-
Arkansas	7.5	-	0.3	-	5.2	-	-	2.0	-	-	-	-
California	350.2	242.5	23.0	-	57.1	2.0	23.4	2.2	-	-	-	-
Colorado	11.9	7.0	4.0	-	0.9	-	-	-	-	-	-	-
Connecticut	89.9	50.3	35.6	-	4.0	-	-	-	-	-	-	-
Delaware	-	-	-	-	-	-	-	-	-	-	-	-
Florida	118.5	41.0	21.1	-	55.4	1.0	-	-	-	-	-	-
Georgia	19.5	16.0	3.5	-	-	-	-	-	-	-	-	-
Hawaii	12.5	-	7.3	-	0.6	2.5	1.3	-	0.8	-	-	-
Idaho	0.3	-	-	-	0.3	-	-	-	-	-	-	-
Illinois	254.6	91.9	75.5	-	27.0	3.1	54.0	-	3.1	-	-	-
Indiana	5.6	-	-	4.0	-	-	-	-	-	-	-	1.6
Iowa	12.6	7.0	4.0	-	1.6	-	-	-	-	-	-	-
Kansas	22.5	10.0	1.2	-	11.3	-	-	-	-	-	-	-
Kentucky	43.8	4.0	4.0	1.5	14.0	16.0	-	-	4.3	-	-	-
Louisiana	28.8	4.8	12.4	0.3	11.5	-	-	-	-	-	-	-
Maine	30.6	1.0	11.6	-	9.0	-	9.0	-	-	-	-	-
Maryland	24.5	13.0	1.5	-	4.0	-	1.0	-	-	2.0	-	-
Massachusetts	24.1	-	10.0	7.5	1.6	-	5.0	-	-	-	-	-
Michigan	73.0	27.1	27.0	-	14.9	4.0	-	-	-	-	-	-
Minnesota	16.5	0.5	7.1	-	8.9	-	-	-	-	-	-	-
Mississippi	20.3	0.3	-	-	16.0	-	2.0	2.0	-	-	-	-
Missouri	27.3	-	12.6	-	10.7	-	4.0	-	-	-	-	-
Montana	11.5	-	10.0	-	0.4	-	0.1	1.0	-	-	-	-
Nebraska	3.2	-	2.3	-	0.9	-	-	-	-	-	-	-
Nevada	2.2	-	-	-	-	1.0	-	-	-	-	1.2	-
New Hampshire	2.9	-	1.9	-	-	-	1.0	-	-	-	-	-
New Jersey	32.5	14.8	-	-	17.7	-	-	-	-	-	-	-
New Mexico	7.0	-	7.0	-	-	-	-	-	-	-	-	-
New York	1,091.9	989.4	21.0	-	73.5	-	6.0	-	2.0	-	-	-
North Carolina	40.8	15.3	25.5	-	-	-	-	-	-	-	-	-
North Dakota	4.0	0.5	3.5	-	-	-	-	-	-	-	-	-
Ohio	26.8	13.6	5.2	0.8	3.2	4.0	-	-	-	-	-	-
Oklahoma	33.4	4.0	17.3	3.5	5.5	-	0.1	-	-	-	-	-
Oregon	14.7	-	12.8	-	1.9	-	-	-	-	-	-	-
Pennsylvania	94.9	64.6	1.6	1.0	22.0	-	5.5	0.2	-	-	-	-
Rhode Island	1.0	-	1.0	-	-	-	-	-	-	-	-	-
South Carolina	28.9	-	21.6	-	-	2.3	-	5.0	-	-	-	-
South Dakota	1.0	-	-	-	-	-	-	-	1.0	-	-	-
Tennessee	20.6	14.2	6.4	-	-	-	-	-	-	-	-	-
Texas	140.0	23.9	98.0	-	8.0	8.2	-	1.9	-	-	-	-
Utah	11.3	5.7	0.3	-	5.3	-	-	-	-	-	-	-
Vermont	-	-	-	-	-	-	-	-	-	-	-	-
Virginia	119.9	6.7	98.0	-	14.2	-	-	-	1.0	-	-	-
Washington	46.7	-	29.2	-	16.5	-	-	-	1.0	-	-	-
West Virginia	48.4	4.0	39.7	-	1.7	3.0	-	-	-	-	-	-
Wisconsin	46.8	7.5	20.3	-	15.0	-	4.0	-	-	-	-	-
Wyoming	16.0	16.0	-	-	-	-	-	-	-	-	-	-

Table B-18.—Full-time-equivalent number of technicians engaged in State agencies, by State and functional area, fiscal year 1973

State	Total	Health	Natural resources	Education	Transportation and communications	Income security and social services	Environment	Crime prevention and control	Economic growth and productivity	Area and community development and housing	Science and technology	Energy development and conversion
Total	3,308.4	1,824.2	772.3	28.8	459.6	64.1	110.9	21.5	13.9	10.0	0.4	2.7
Alabama	5.3	-	4.3	-	-	0.5	0.5	-	-	-	-	-
Alaska	43.9	0.4	43.0	-	0.5	-	-	-	-	-	-	-
Arizona	11.0	-	3.0	-	2.0	5.0	-	1.0	-	-	-	-
Arkansas	9.1	-	0.3	-	3.5	3.3	-	2.0	-	-	-	-
California	380.1	269.8	24.5	-	66.0	6.0	9.7	4.1	-	-	-	-
Colorado	16.1	9.0	7.0	-	0.1	-	-	-	-	-	-	-
Connecticut	86.8	48.7	33.6	-	4.0	0.5	-	-	-	-	-	-
Delaware	1.0	-	1.0	-	-	-	-	-	-	-	-	-
Florida	114.0	40.0	19.0	-	54.0	1.0	-	-	-	-	-	-
Georgia	22.9	16.9	3.5	1.1	-	1.4	-	-	-	-	-	-
Hawaii	17.1	0.2	9.6	-	1.6	3.0	2.0	-	0.7	-	-	-
Idaho	1.0	-	-	-	1.0	-	-	-	-	-	-	-
Illinois	267.0	83.2	92.5	-	25.3	6.9	55.9	-	3.2	-	-	-
Indiana	6.2	-	-	4.0	-	-	-	-	-	-	-	2.2
Iowa	14.9	9.0	4.3	-	1.6	-	-	-	-	-	-	-
Kansas	22.8	10.7	1.2	-	10.9	-	-	-	-	-	-	-
Kentucky	37.7	-	3.6	-	19.0	12.1	-	-	3.0	-	-	-
Louisiana	28.8	4.6	13.7	0.3	10.2	-	-	-	-	-	-	-
Maine	34.4	1.0	11.6	-	12.0	-	9.8	-	-	-	-	-
Maryland	36.9	18.0	3.0	-	4.2	0.7	1.0	-	-	10.0	-	-
Massachusetts	26.9	0.3	10.0	8.7	1.9	-	5.0	1.0	-	-	-	-
Michigan	86.1	38.0	27.0	-	17.1	4.0	-	-	-	-	-	-
Minnesota	17.6	0.5	7.6	-	9.5	-	-	-	-	-	-	-
Mississippi	23.3	0.3	-	-	16.0	-	2.0	5.0	-	-	-	-
Missouri	25.8	-	13.3	-	8.0	-	4.5	-	-	-	-	-
Montana	13.6	2.0	10.2	-	0.3	-	0.1	1.0	-	-	-	-
Nebraska	3.5	-	2.9	-	0.6	-	-	-	-	-	-	-
Nevada	2.4	-	-	-	-	2.0	-	-	-	-	0.4	-
New Hampshire	3.2	-	2.4	-	-	-	0.8	-	-	-	-	-
New Jersey	25.3	10.8	0.3	-	14.2	-	-	-	-	-	-	-
New Mexico	7.0	-	7.0	-	-	-	-	-	-	-	-	-
New York	1,174.9	1,065.1	24.0	-	74.8	-	9.0	-	2.0	-	-	-
North Carolina	44.0	11.5	26.5	6.0	-	-	-	-	-	-	-	-
North Dakota	4.0	0.5	3.5	-	-	-	-	-	-	-	-	-
Ohio	32.8	11.1	13.9	0.7	2.6	4.5	-	-	-	-	-	-
Oklahoma	34.5	5.0	18.4	5.5	4.5	-	1.1	-	-	-	-	-
Oregon	17.0	-	13.5	-	3.0	-	-	-	-	-	-	0.5
Pennsylvania	109.4	73.9	3.8	1.0	25.0	-	5.5	0.2	-	-	-	-
Rhode Island	1.3	0.3	1.0	-	-	-	-	-	-	-	-	-
South Carolina	26.6	-	22.1	-	-	3.0	-	4.5	-	-	-	-
South Dakota	2.5	-	-	1.5	-	-	-	-	1.0	-	-	-
Tennessee	22.5	15.8	6.7	-	-	-	-	-	-	-	-	-
Texas	147.6	23.0	104.0	-	8.0	10.2	-	2.4	-	-	-	-
Utah	12.4	5.7	0.3	-	6.4	-	-	-	-	-	-	-
Vermont	-	-	-	-	-	-	-	-	-	-	-	-
Virginia	118.6	17.9	82.9	-	16.8	-	-	-	1.0	-	-	-
Washington	52.1	0.5	32.3	-	18.3	-	-	-	1.0	-	-	-
West Virginia	47.4	4.0	39.7	-	1.7	-	-	-	2.0	-	-	-
Wisconsin	49.8	10.5	20.3	-	15.0	-	4.0	-	-	-	-	-
Wyoming	16.3	16.0	-	-	-	-	-	0.3	-	-	-	-

Table B-19.—Full-time-equivalent number of scientists and engineers engaged in research and development in State agencies, by State and field of science, fiscal year 1972

State	Total	Biological sciences	Clinical medical sciences	Psychology	Physical sciences	Environmental sciences	Mathematics	Engineering	Social sciences	Other sciences
Total	4,610.4	2,008.2	698.6	328.2	127.5	237.3	37.4	396.0	749.7	27.5
Alabama	14.6	5.6	-	7.0	-	1.5	-	0.5	-	-
Alaska	75.7	74.0	-	0.3	-	-	-	1.4	-	-
Arizona	17.5	9.0	-	-	-	-	-	7.0	1.5	-
Arkansas	26.4	0.3	-	17.0	-	-	1.0	5.1	3.0	-
California	643.6	264.6	183.1	29.9	58.4	26.2	4.0	29.5	41.3	6.6
Colorado	57.6	37.0	-	11.0	-	-	-	6.6	3.0	-
Connecticut	76.7	61.4	1.5	4.6	-	-	-	9.2	-	-
Delaware	9.2	8.1	-	1.1	-	-	-	-	-	-
Florida	315.1	78.9	50.3	6.8	-	2.5	-	30.7	145.9	-
Georgia	54.8	0.3	3.5	4.5	-	25.0	-	12.8	8.5	0.2
Hawaii	79.8	13.8	1.8	-	-	2.0	-	0.6	61.6	-
Idaho	28.6	25.0	-	-	1.5	-	-	0.7	1.4	-
Illinois	327.9	79.9	50.3	42.8	13.1	26.6	-	30.3	84.9	-
Indiana	33.7	23.0	6.7	4.0	-	-	-	-	-	-
Iowa	28.4	10.0	15.7	-	-	-	-	2.3	0.4	-
Kansas	15.8	2.4	-	1.0	-	-	-	10.4	2.0	-
Kentucky	94.7	9.3	-	-	-	-	-	22.0	63.4	-
Louisiana	46.6	27.9	5.6	0.5	-	0.1	-	9.5	-	3.0
Maine	59.5	52.8	-	-	-	-	-	4.0	2.7	-
Maryland	74.9	26.5	15.6	9.5	5.0	5.0	-	6.3	7.0	-
Massachusetts	79.4	37.7	10.2	23.2	-	0.8	-	1.0	6.5	-
Michigan	119.1	45.0	21.4	10.1	-	-	7.0	9.6	26.0	-
Minnesota	33.8	15.0	3.0	-	-	-	-	7.2	5.8	3.0
Mississippi	27.0	2.0	-	3.0	-	-	-	12.0	10.0	-
Missouri	36.2	30.5	-	0.2	-	1.4	0.2	3.9	-	-
Montana	34.5	31.6	-	-	0.5	0.1	-	0.2	2.1	-
Nebraska	9.2	8.1	-	-	-	-	-	0.2	0.9	-
Nevada	30.7	27.2	-	0.5	-	-	-	-	3.0	-
New Hampshire	5.5	5.5	-	-	-	-	-	-	-	-
New Jersey	70.9	15.7	7.2	15.0	3.0	0.1	-	25.2	2.0	2.7
New Mexico	27.0	27.0	-	-	-	-	-	-	-	-
New York	876.9	352.3	259.4	46.3	39.1	31.0	21.2	44.0	75.6	8.0
North Carolina	60.2	36.4	2.0	7.9	-	10.0	-	1.0	3.9	-
North Dakota	15.3	13.0	2.3	-	-	-	-	-	-	-
Ohio	73.5	34.4	1.7	15.2	-	7.0	-	4.5	10.7	-
Oklahoma	43.4	17.1	4.0	-	3.0	7.8	-	4.0	7.5	-
Oregon	49.7	45.5	-	-	-	-	-	1.4	2.8	-
Pennsylvania	141.1	32.9	14.9	30.6	-	-	-	17.0	45.7	-
Rhode Island	5.5	5.5	-	-	-	-	-	-	-	-
South Carolina	31.5	12.0	-	0.5	-	1.9	-	-	17.1	-
South Dakota	29.5	12.0	-	-	-	14.6	-	2.0	0.9	-
Tennessee	62.9	54.5	-	-	-	3.0	-	-	5.4	-
Texas	137.7	105.9	3.1	2.6	3.3	5.0	-	7.0	10.8	-
Utah	36.6	12.4	14.0	7.0	0.6	-	-	2.6	-	-
Vermont	11.0	8.0	-	-	-	-	-	-	3.0	-
Virginia	204.1	63.1	6.3	1.4	-	38.6	4.0	52.6	34.1	4.0
Washington	97.8	75.2	-	5.0	-	-	-	3.0	14.6	-
West Virginia	32.3	16.5	1.0	4.0	-	9.5	-	1.3	-	-
Wisconsin	125.1	41.4	9.5	15.7	-	17.6	-	7.0	33.9	-
Wyoming	21.9	16.0	4.5	-	-	-	-	0.4	1.0	-

Table B-20.—Full-time-equivalent number of scientists and engineers engaged in research and development in State agencies, by State and field of science, fiscal year 1973

State	Total	Biological sciences	Clinical medical sciences	Psychology	Physical sciences	Environmental sciences	Mathematics	Engineering	Social sciences	Other sciences
Total	4,898.9	2,139.4	730.1	323.4	133.2	273.0	38.7	416.9	813.7	30.5
Alabama	15.9	5.6	-	7.0	-	2.3	-	0.5	0.5	-
Alaska	81.6	73.5	-	0.5	-	-	-	7.6	-	-
Arizona	18.4	8.0	-	0.4	-	-	-	8.5	1.5	-
Arkansas	13.3	0.3	-	7.0	-	-	-	3.0	2.5	0.5
California	694.5	267.3	207.4	39.2	60.8	17.0	2.3	34.2	56.9	9.4
Colorado	60.4	43.0	-	10.0	-	-	-	2.9	4.5	-
Connecticut	82.0	64.5	2.5	4.6	-	-	-	10.4	-	-
Delaware	9.8	7.8	1.5	-	-	0.5	-	-	-	-
Florida	363.6	88.1	52.5	6.0	-	2.5	-	32.0	182.5	-
Georgia	60.9	0.3	9.1	2.2	-	24.0	-	10.2	14.9	0.2
Hawaii	65.3	11.9	1.8	0.2	-	2.6	-	0.8	48.0	-
Idaho	28.5	25.0	-	-	1.5	-	-	1.0	1.0	-
Illinois	301.6	81.0	27.5	40.1	14.1	26.6	-	28.3	84.0	-
Indiana	33.6	22.5	6.7	4.2	-	-	-	-	0.2	-
Iowa	22.0	12.0	6.2	0.2	-	0.9	-	2.3	0.4	-
Kansas	19.2	1.0	-	-	0.1	-	-	12.1	6.0	-
Kentucky	74.0	9.5	-	-	-	-	-	24.0	40.5	-
Louisiana	51.5	30.7	5.6	3.5	-	0.3	-	8.4	-	3.0
Maine	62.3	55.8	-	-	-	0.2	-	4.0	2.3	-
Maryland	87.4	38.5	13.2	9.1	5.0	10.0	-	4.6	7.0	-
Massachusetts	99.0	44.2	13.3	27.2	-	1.8	-	1.4	11.1	-
Michigan	125.4	48.1	23.1	8.3	-	-	8.7	11.0	26.2	-
Minnesota	33.9	15.0	3.0	-	-	-	-	7.4	5.5	3.0
Mississippi	30.5	4.3	-	4.2	-	-	-	12.0	10.0	-
Missouri	33.3	28.5	-	0.4	-	1.1	-	3.0	0.3	-
Montana	37.4	30.7	-	-	0.5	2.2	-	-	4.0	-
Nebraska	11.9	9.2	-	-	-	-	-	0.3	2.4	-
Nevada	36.5	29.7	3.0	0.5	-	-	-	-	3.3	-
New Hampshire	4.5	4.5	-	-	-	-	-	-	-	-
New Jersey	80.8	13.5	6.2	14.5	2.7	5.1	-	22.6	13.5	2.7
New Mexico	27.0	27.0	-	-	-	-	-	-	-	-
New York	950.6	382.9	282.6	52.1	44.1	37.0	22.9	46.2	74.8	8.0
North Carolina	60.8	36.7	1.8	8.9	-	10.0	-	1.0	2.4	-
North Dakota	17.8	13.0	2.3	-	0.5	-	-	2.0	-	-
Ohio	90.8	61.5	1.8	10.1	-	7.0	-	4.8	5.6	-
Oklahoma	44.1	17.7	4.0	-	3.0	10.9	-	0.5	8.0	-
Oregon	55.1	48.3	-	-	-	1.3	-	2.7	2.8	-
Pennsylvania	138.0	34.3	13.0	23.8	-	-	-	20.0	46.9	-
Rhode Island	5.6	5.5	0.1	-	-	-	-	-	-	-
South Carolina	30.4	12.0	-	0.1	-	1.9	-	-	16.4	-
South Dakota	32.0	12.0	-	-	-	14.7	-	3.0	2.3	-
Tennessee	61.4	52.5	1.1	-	-	4.0	-	-	3.8	-
Texas	134.9	106.4	3.0	2.9	0.3	3.2	-	7.0	12.1	-
Utah	37.4	13.6	13.2	7.3	0.6	-	-	2.7	-	-
Vermont	16.2	8.0	-	-	-	-	-	0.2	8.0	-
Virginia	246.2	70.2	10.0	4.7	-	52.7	4.8	63.0	37.1	3.7
Washington	117.6	83.9	0.5	5.0	-	-	-	3.0	25.2	-
West Virginia	38.0	16.5	1.0	4.0	-	15.6	-	0.8	0.1	-
Wisconsin	130.0	41.4	9.6	15.2	-	17.6	-	7.0	39.2	-
Wyoming	26.0	22.0	3.5	-	-	-	-	0.5	-	-

Table B-21.—Full-time-equivalent number of technicians engaged in research and development in State agencies, by State and field of science, fiscal year 1972

State	Total	Biological sciences	Clinical medical sciences	Psychology	Physical sciences	Environmental sciences	Mathematics	Engineering	Social sciences	Other sciences
Total	3,094.1	1,208.6	760.4	204.8	90.2	149.7	45.7	415.7	203.0	18.0
Alabama	4.6	4.3	-	-	-	0.3	-	-	-	-
Alaska	37.9	37.0	-	-	-	-	-	-	0.9	-
Arizona	10.7	4.0	-	-	-	-	-	1.7	5.0	-
Arkansas	7.5	0.3	-	-	-	-	-	5.2	2.0	-
California	350.2	31.1	178.0	24.9	22.5	30.4	7.7	46.1	9.5	-
Colorado	11.9	4.0	-	7.0	-	-	-	0.9	-	-
Connecticut	89.9	55.1	26.3	4.5	-	-	-	4.0	-	-
Delaware	-	-	-	-	-	-	-	-	-	-
Florida	118.5	34.1	11.2	2.3	-	4.8	-	50.6	15.5	-
Georgia	19.5	7.1	4.9	4.0	-	3.5	-	-	-	-
Hawaii	12.5	6.3	-	-	-	1.3	-	0.6	4.3	-
Idaho	0.3	-	-	-	-	-	-	0.3	-	-
Illinois	254.6	80.7	47.5	27.7	15.8	38.2	-	36.5	8.2	-
Indiana	5.6	-	1.5	0.1	-	-	-	-	4.0	-
Iowa	12.6	4.0	7.0	-	-	-	-	1.6	-	-
Kansas	22.5	-	-	1.0	-	-	-	12.5	9.0	-
Kentucky	43.8	4.0	-	-	-	-	-	14.0	25.8	-
Louisiana	28.8	16.4	-	-	-	-	-	11.5	-	0.9
Maine	30.6	21.6	-	-	-	-	-	9.0	-	-
Maryland	24.5	4.5	3.0	3.0	5.0	3.0	-	4.0	2.0	-
Massachusetts	24.1	15.0	-	-	-	1.2	-	0.4	7.5	-
Michigan	73.0	27.0	15.1	12.0	-	-	4.0	14.9	-	-
Minnesota	16.5	4.1	-	-	-	-	-	-	0.5	11.9
Mississippi	20.3	2.0	-	0.3	-	-	-	16.0	2.0	-
Missouri	27.3	16.5	-	-	-	0.1	0.4	10.3	-	-
Montana	11.5	10.0	-	-	0.3	0.1	-	0.1	1.0	-
Nebraska	3.2	2.3	-	-	-	-	-	0.9	-	-
Nevada	2.2	1.2	-	1.0	-	-	-	-	-	-
New Hampshire	2.9	2.9	-	-	-	-	-	-	-	-
New Jersey	32.5	0.3	12.5	1.0	2.1	-	-	15.6	1.0	-
New Mexico	7.0	7.0	-	-	-	-	-	-	-	-
New York	1,091.9	411.7	400.7	63.2	39.3	8.0	32.8	86.8	49.4	-
North Carolina	40.8	17.5	4.0	11.3	-	8.0	-	-	-	-
North Dakota	4.0	3.5	0.5	-	-	-	-	-	-	-
Ohio	26.8	10.1	0.4	4.0	-	-	-	7.5	4.8	-
Oklahoma	33.4	10.3	4.0	-	4.0	7.6	-	1.0	6.5	-
Oregon	14.7	12.8	-	-	-	-	-	1.9	-	-
Pennsylvania	94.9	25.4	14.9	7.3	-	-	-	22.0	20.3	5.0
Rhode Island	1.0	1.0	-	-	-	-	-	-	-	-
South Carolina	28.9	21.0	-	3.0	-	-	-	-	4.9	-
South Dakota	1.0	-	-	-	-	-	-	-	1.0	-
Tennessee	20.6	20.6	-	-	-	-	-	-	-	-
Texas	140.0	116.2	3.2	2.5	-	-	-	8.0	10.1	-
Utah	11.3	0.3	5.7	-	1.2	-	-	4.1	-	-
Vermont	-	-	-	-	-	-	-	-	-	-
Virginia	119.9	74.0	0.5	6.2	-	25.4	0.8	9.0	3.8	0.2
Washington	46.7	29.2	-	14.5	-	-	-	2.0	1.0	-
West Virginia	48.4	37.2	1.0	3.0	-	2.5	-	1.7	3.0	-
Wisconsin	46.8	13.0	2.5	1.0	-	15.3	-	15.0	-	-
Wyoming	16.0	-	16.0	-	-	-	-	-	-	-

Table B-22.—Full-time-equivalent number of technicians engaged in research and development in State agencies, by State and field of science, fiscal year 1973

State	Total	Biological sciences	Clinical medical sciences	Psychology	Physical sciences	Environmental sciences	Mathematics	Engineering	Social sciences	Other sciences
Total	3,308.4	1,255.9	827.5	237.6	93.7	155.0	48.9	438.4	231.9	19.5
Alabama	5.3	4.3	-	-	-	0.5	-	-	0.5	-
Alaska	43.9	43.0	-	-	-	-	-	0.5	0.4	-
Arizona	11.0	3.0	-	-	-	-	-	2.0	6.0	-
Arkansas	9.1	0.3	3.3	-	-	-	-	3.5	2.0	-
California	380.1	35.7	196.7	29.3	22.8	16.6	4.4	56.7	17.9	-
Colorado	16.1	7.0	-	9.0	-	-	-	0.1	-	-
Connecticut	86.8	49.6	28.2	4.5	-	-	-	4.0	0.5	-
Delaware	1.0	-	-	-	-	1.0	-	-	-	-
Florida	114.0	32.0	12.0	0.8	-	4.8	-	19.2	15.2	-
Georgia	22.9	8.1	4.8	4.1	-	3.5	-	1.0	1.4	-
Hawaii	17.1	7.3	-	0.2	-	2.0	-	1.6	6.0	-
Idaho	1.0	-	-	-	-	-	-	1.0	-	-
Illinois	267.0	90.0	45.7	27.9	15.8	40.1	-	34.8	12.7	-
Indiana	6.2	-	1.5	0.7	-	-	-	-	4.0	-
Iowa	14.9	4.0	9.0	-	-	0.3	-	1.6	-	-
Kansas	22.8	-	-	1.7	-	-	-	12.1	9.0	-
Kentucky	37.7	3.6	-	-	-	-	-	19.0	15.1	-
Louisiana	28.8	17.7	-	-	-	-	-	10.2	-	0.9
Maine	34.4	21.6	-	-	-	0.8	-	12.0	-	-
Maryland	36.9	5.0	3.0	6.7	5.0	11.0	-	4.2	2.0	-
Massachusetts	26.9	15.0	-	-	-	1.7	-	0.2	9.7	0.3
Michigan	86.1	37.0	18.3	5.0	-	-	5.7	20.1	-	-
Minnesota	17.6	4.6	-	-	-	-	-	-	0.5	12.5
Mississippi	23.3	2.0	-	0.3	-	-	-	16.0	5.0	-
Missouri	25.8	17.0	-	-	-	0.8	-	8.0	-	-
Montana	13.6	9.7	-	-	0.3	0.6	-	-	3.0	-
Nebraska	3.5	2.9	-	-	-	-	-	0.6	-	-
Nevada	2.4	0.4	-	2.0	-	-	-	-	-	-
New Hampshire	3.2	3.2	-	-	-	-	-	-	-	-
New Jersey	25.3	0.4	10.1	0.5	1.8	0.1	-	12.4	-	-
New Mexico	7.0	7.0	-	-	-	-	-	-	-	-
New York	1,171.9	425.4	438.9	70.0	43.8	12.0	38.0	91.4	55.4	-
North Carolina	44.0	12.2	3.2	19.6	-	8.0	-	-	1.0	-
North Dakota	4.0	3.5	0.5	-	-	-	-	-	-	-
Ohio	32.8	19.1	0.5	2.6	-	-	-	5.4	5.2	-
Oklahoma	34.5	11.3	5.0	-	3.0	9.2	-	0.5	5.5	-
Oregon	17.0	13.5	-	-	-	0.5	-	3.0	-	-
Pennsylvania	109.4	30.1	15.6	10.0	-	-	-	25.0	23.7	5.0
Rhode Island	1.3	1.0	0.3	-	-	-	-	-	-	-
South Carolina	29.6	21.0	-	3.0	-	-	-	-	5.6	-
South Dakota	2.5	-	-	-	-	-	-	-	2.5	-
Tennessee	22.5	22.5	-	-	-	-	-	-	-	-
Texas	147.6	120.3	3.2	2.5	-	-	-	8.0	13.6	-
Utah	12.4	0.3	5.7	-	1.2	-	-	5.2	-	-
Vermont	-	-	-	-	-	-	-	-	-	-
Virginia	118.6	60.8	0.5	17.4	-	23.7	0.8	10.4	4.2	0.8
Washington	52.1	32.3	-	15.8	-	-	-	2.0	2.0	-
West Virginia	47.4	37.2	1.0	3.0	-	2.5	-	1.7	2.0	-
Wisconsin	49.8	14.0	4.5	1.0	-	13.3	-	15.0	-	-
Wyoming	16.3	-	16.0	-	-	-	-	-	0.3	-

Table B-23. State agency R&D and R&D plant expenditures, fiscal years 1964, 1965, 1967, 1968, 1972, and 1973

(Dollars in thousands)

Category of expenditure	1964	1965	1967	1968	1972	1973
Total, R&D and R&D plant	$77,352	$93,256	$136,299	$159,214	$242,098	$273,371
Research and development	72,002	87,886	131,187	154,724	234,923	263,778
Basic research	24,855	30,351	32,302	35,552	52,601	57,626
Applied research	32,848	39,064	65,268	76,683	142,524	163,375
Development	14,299	18,471	33,617	42,489	39,798	42,776
R&D plant	5,350	5,370	5,112	4,490	7,176	9,595

Table B-24. State agency R&D expenditures,[1] by function, fiscal years 1964, 1965, 1967, 1968, 1972, and 1973

(Dollars in thousands)

Functional area	1964	1965	1967	1968	1972	1973
Total	$72,002	$87,886	$131,187	$154,724	$234,923	$263,778
Health	26,898	32,834	57,909	66,570	83,714	92,042
Natural resources	21,597	22,919	28,312	34,111	50,708	59,193
Education	1,411	5,885	11,611	15,631	35,968	39,954
Transportation and communications	12,857	14,920	19,042	20,400	30,495	31,198
Income security and social services	3,734	4,368	2,907	3,254	17,671	20,202
Environment	418	571	6,589	7,861	9,793	12,198
Crime prevention and control	579	700	1,946	2,653	3,575	4,564
Economic growth and productivity	1,625	2,526	1,208	2,061	1,613	1,753
Area and community development and housing	2,503	2,478	851	861	626	1,409
Science and technology	339	629	718	1,014	614	793
Energy development and conservation	41	58	95	308	147	562

[1] R&D plant excluded.

Table B-25. State agency R&D expenditures,[1] by source of funds, fiscal years 1964, 1965, 1967, 1968, 1972, and 1973

(Dollars in thousands)

Source	1964	1965	1967	1968	1972	1973
Total	$72,002	$87,886	$131,187	$154,724	$234,923	$263,778
Federal Government	28,873	36,385	63,492	75,899	119,664	133,564
State government	42,049	49,831	64,651	75,487	111,159	125,518
Other sources[2]	1,080	1,670	3,044	3,338	4,099	4,695

[1] R&D plant excluded.
[2] Foundations, business firms, and other nongovernmental sources.

Table B-26. State agency R&D expenditures[1] by field of science, fiscal years 1964, 1965, 1967, 1968, 1972, and 1973

(Dollars in thousands)

Field of science	1964	1965	1967	1968	1972	1973
Total	$72,002	$87,886	$131,187	$154,724	$234,923	$263,778
Biological sciences	24,311	27,692	49,297	56,030	75,134	83,280
Clinical medical sciences	18,216	22,170	26,071	30,590	35,957	38,123
Psychology	2,794	3,476	7,745	10,189	16,022	18,655
Physical sciences	882	1,238	779	1,363	5,396	7,065
Environmental sciences	2,453	2,808	8,771	11,634	11,021	13,851
Mathematics	85	256	875	1,066	1,603	1,860
Engineering	13,580	14,997	20,468	22,653	29,143	30,456
Social sciences	9,044	13,235	16,479	20,351	58,008	67,145
Other sciences	637	2,014	703	847	2,639	3,341

[1] R&D plant excluded.

Table B-27. State agency R&D expenditures,[1] by performer, fiscal years 1964, 1965, 1967, 1968, 1972, and 1973

(Dollars in thousands)

Performer	1964	1965	1967	1968	1972	1973
Total	$72,002	$87,886	$131,187	$154,724	$234,923	$263,778
State agencies	52,326	67,905	110,612	126,702	160,455	178,082
Universities and colleges[2]	7,636	9,930	12,528	14,632	29,160	32,953
Others[3]	8,040	10,031	8,047	13,389	45,309	52,742

[1] R&D plant excluded.
[2] The research and development performed at universities and colleges that is sponsored or financed by State agencies.
[3] Research and development contracted to private individuals or firms, private nonprofit organizations, other agencies of the State, and other governmental agencies (such as local governments, agencies of other States, and multigovernmental agencies).

Table B-28. Full-time equivalent personnel engaged in State agency intramural R&D activities, by type, fiscal years 1964, 1965, 1967, 1968, 1972, and 1973

Type of personnel	1964	1965	1967	1968	1972	1973
Total	6,435	7,617	8,257	9,137	10,798	11,514
Scientists and engineers	2,721	3,208	3,364	3,733	4,610	4,899
Technicians	1,784	2,058	2,624	2,869	3,094	3,308
Other[1]	1,930	2,352	2,269	2,534	3,093	3,307

[1] Clerks, typists, and administrative support personnel.

APPENDIX C

R&D Activities at State Universities and Colleges, 1973

The data on the R&D activities of State universities and colleges were derived from the National Science Foundation *Survey of Scientific Activities at Institutions of Higher Education, 1973*, which included all universities, public and private. The data on State universities and colleges including affiliated organizations such as research centers, medical schools, and agricultural experiment stations, covered research and development financed through the Federal Government, through regular State appropriations, through the institutions' own funds, and through other sources. Work done for State agencies, local government agencies, and private organizations on a grant or contract basis was included.

A small overlap exists between the data on R&D activities of State government agencies, as shown in appendix B and throughout this report, and the data in the tables on State universities and colleges in appendix C. In 1973 State universities and colleges expended $1,754 million for research and development, of which $28 million was the amount of their performance for State government agencies. The same $28 million is included in the $264 million expended by State government agencies for R&D activities in 1973.

The $1,754 million expended by State universities and colleges in 1973 compares with R&D expenditures in 1964 amounting to $646 million and in 1968 to $1,178 million. Thus, from 1964 to 1973 the average annual growth rate was 12 percent compared with 16 percent for R&D expenditures by State government agencies.

State universities and colleges concentrate largely on basic research, whereas State government agencies emphasize applied research. In neither case has much emphasis been placed on development. In 1973 State universities and colleges reported 65 percent of their R&D expenditures for basic research compared with 22 percent for State government agencies. Comparable figures for applied research were 29 percent versus 62 percent.

For both State universities and colleges and State government agencies the Federal Government has been the major source of R&D funds. However, substantially more of the State university and college R&D effort was supported through Federal funding than was the case for State government agencies (64 percent versus 50 percent in 1973). For State universities and colleges the remaining funds were fairly evenly divided between State appropriations, the institutions' own funds, and other sources.

The distribution of State university and college and State government agency R&D funds by field of science was similar in some respects. The life sciences (biology and clinical medical sciences) received the most support in 1973 (approximately one-half of the total for both institutional groups). The engineering sciences also received about the same shares of total (11 percent and 12 percent). The chief exception was in the social sciences, which accounted for 25 percent of State government agency R&D expenditures but only 9 percent of the State university and college R&D expenditures. The relative level of support for the physical sciences also differed; this field accounted for 3 percent of State government agency R&D funds but 11 percent of the State university and college total.

In the case of both State universities and colleges and State government agencies R&D expenditures tend to be concentrated in a relatively few States, but the level of concentration is substantially higher with respect to State government agencies. The leading 10 States accounted for 53 percent of total R&D funds spent by State universities and colleges in 1973 whereas for State government agencies the leading 10 States accounted for 64 percent of the total. Six States—California, Michigan, Texas, Washington, Illinois and Indiana—were included in both lists. Although in the State universities and colleges list New York accounted for only 3 percent of the total, in the State government agencies list New York was the leading R&D support State by a wide margin, with 23 percent of the total expenditures for all States. If all universities and colleges (Federal, State, local and private) are included, however, New York was the second State after California in terms of R&D expenditures in 1973.

Table C-1. State university and college expenditures for research and development, by State and character of work, fiscal year 1973

[Dollars in thousands]

State	Total	Basic research	Applied research	Development
Total	[1]$1,754,218	$1,139,963	$516,255	$98,000
Alabama	24,878	9,407	14,460	1,011
Alaska	16,560	5,465	11,095	0
Arizona	30,321	20,715	6,827	2,779
Arkansas	10,185	6,728	3,151	306
California	275,452	181,760	79,903	13,789
Colorado	56,204	31,856	20,911	3,437
Connecticut	16,381	12,286	3,931	164
Delaware	5,760	4,608	922	230
Florida	42,462	27,866	10,105	4,491
Georgia	42,268	18,441	22,039	1,788
Hawaii	26,859	16,921	7,789	2,149
Idaho	8,727	3,151	2,662	2,914
Illinois	53,119	35,645	17,405	69
Indiana	51,932	33,796	10,326	7,810
Iowa	32,073	27,791	3,456	826
Kansas	31,277	14,743	14,055	2,479
Kentucky	17,124	9,130	4,331	3,663
Louisiana	21,953	15,769	6,020	164
Maine	6,438	2,575	2,575	1,288
Maryland	27,717	20,541	7,026	150
Massachusetts	10,570	7,886	2,137	547
Michigan	111,946	79,353	26,959	5,634
Minnesota	53,701	23,701	27,849	2,151
Mississippi	19,023	9,197	8,530	1,296
Missouri	34,461	25,221	4,575	4,665
Montana	8,654	5,927	2,526	201
Nebraska	17,711	12,523	4,909	279
Nevada	6,449	2,845	2,487	1,117
New Hampshire	3,856	1,851	1,928	77
New Jersey	25,913	16,809	7,912	1,192
New Mexico	18,170	10,388	4,260	3,522
New York	51,006	33,727	15,463	1,816
North Carolina	53,762	33,790	14,656	5,316
North Dakota	6,701	1,408	5,291	2
Ohio	38,155	26,170	11,741	244
Oklahoma	19,633	12,510	5,555	1,568
Oregon	33,982	21,426	11,292	1,264
Pennsylvania	45,931	29,636	13,706	2,589
Rhode Island	8,855	6,198	1,771	886
South Carolina	10,975	6,377	4,072	526
South Dakota	6,711	2,578	3,328	805
Tennessee	12,356	3,015	8,811	530
Texas	111,121	83,529	24,635	2,957
Utah	33,306	22,081	9,560	1,665
Vermont	7,188	3,738	3,234	216
Virginia	34,331	22,018	10,964	1,349
Washington	69,321	46,902	20,201	2,218
West Virginia	6,960	4,600	2,015	345
Wisconsin	89,102	81,959	4,428	2,715
Wyoming	6,678	3,406	2,471	801

[1] Does not include $7.3 million in R&D expenditures of public universities and colleges in outlying areas (primarily Puerto Rico)

Table C-2. State University and college expenditures for research and development, by State and field of science, fiscal year 1973

[Dollars in thousands]

State	Total	Life sciences	Psychology	Physical sciences	Environmental sciences	Mathematics	Engineering	Social sciences	Other sciences
Total	$1,754,218	$910,042	$47,295	$190,398	$143,887	$40,317	$200,895	$156,281	$65,103
Alabama	24,878	18,520	858	686	1,241	37	2,653	731	152
Alaska	16,560	4,150	0	4,984	5,247	2	447	1,730	0
Arizona	30,321	11,720	1,105	8,413	3,816	201	2,085	2,981	0
Arkansas	10,185	7,626	13	329	933	7	486	759	32
California	275,452	154,374	7,153	33,284	36,493	4,985	21,560	14,742	2,861
Colorado	56,204	23,378	2,337	8,177	3,974	1,089	6,060	3,699	7,490
Connecicut	16,381	10,076	668	574	930	740	1,748	1,645	0
Delaware	5,760	1,320	238	927	1,392	51	1,438	394	0
Florida	42,462	22,074	1,678	5,901	2,042	1,437	4,553	4,716	61
Georgia	42,268	18,712	1,042	5,277	264	1,302	8,363	7,168	140
Hawaii	26,859	10,464	339	3,309	6,838	58	2,161	3,105	585
Idaho	8,727	5,516	2	298	282	3	594	668	1,364
Illinois	53,119	18,949	1,909	6,398	3,108	3,971	11,365	5,123	2,296
Indiana	51,932	24,517	1,016	6,731	448	1,473	6,775	8,725	2,247
Iowa	32,073	19,199	325	4,524	146	1,288	3,539	2,923	129
Kansas	31,277	17,691	2,539	1,563	2,390	592	3,076	2,936	490
Kentucky	17,124	10,798	528	675	298	75	1,189	2,082	1,479
Louisiana	21,953	14,205	388	2,380	2,022	635	1,162	859	302
Maine	6,438	3,200	101	230	1,757	0	333	817	0
Maryland	27,717	12,236	319	6,753	2,236	1,974	3,154	843	202
Massachusetts	10,570	2,562	666	2,234	1,805	266	1,446	1,570	21
Michigan	111,946	49,153	5,723	7,254	3,948	2,267	21,415	18,842	3,344
Minnesota	53,701	33,989	1,036	3,991	971	909	4,774	5,072	2,959
Mississippi	19,023	15,019	190	962	168	92	1,196	1,395	1
Missouri	34,461	24,387	343	1,306	832	353	4,530	1,451	1,259
Montana	8,654	4,980	88	711	821	17	1,524	513	0
Nebraska	17,711	13,641	48	689	1,317	128	1,117	771	0
Nevada	6,449	1,913	115	3,414	572	1	79	355	0
New Hampshire	3,856	1,645	172	834	213	31	823	138	0
New Jersey	25,913	12,676	964	2,965	1,896	950	1,595	3,942	925
New Mexico	18,170	3,420	474	1,107	2,030	142	7,258	2,920	819
New York	51,006	28,024	1,108	5,647	5,009	2,153	2,778	3,985	2,302
North Carolina	53,762	31,831	560	1,565	987	985	5,699	3,667	8,468
North Dakota	6,701	5,775	2	149	396	1	297	81	0
Ohio	38,155	17,819	740	4,162	1,884	588	6,873	5,403	686
Oklahoma	19,633	10,433	240	703	532	406	2,739	800	3,780
Oregon	33,982	19,414	785	2,257	5,810	383	1,054	4,211	68
Pennsylvania	45,931	20,782	982	6,236	4,314	264	5,148	5,437	2,768
Rhode Island	8,855	3,222	455	1,799	0	474	1,581	1,324	0
South Carolina	10,975	7,591	154	315	473	99	830	1,071	442
South Dakota	6,711	3,681	174	66	1,100	2	578	479	631
Tennessee	12,356	7,949	383	691	74	57	2,284	886	32
Texas	111,121	55,093	2,557	14,632	5,868	2,778	16,230	6,737	7,226
Utah	33,306	17,897	598	3,076	2,582	2,322	5,820	1,011	0
Vermont	7,188	5,871	415	207	135	5	86	344	125
Virginia	34,331	19,358	316	4,473	1,014	709	5,884	832	1,745
Washington	69,321	44,255	783	5,173	9,112	663	7,173	1,998	164
West Virginia	6,960	4,445	57	69	10	1	2,032	345	1
Wisconsin	89,102	31,809	4,472	10,730	12,755	3,349	4,767	13,768	7,452
Wyoming	6,678	2,683	137	1,568	1,402	2	544	287	55

[1] Does not include $7.3 million in R&D expenditures of public universities and colleges in outlying areas (primarily Puerto Rico)

Table C-3. State university and college expenditures for research and development, by State and source of funds, fiscal year 1973

[Dollars in thousands]

State	Total	Federal Government	State governments	Local governments	Foundations and health organizations	Industrial firms	State university and college funds[3]	Other[4]
Total	[1]$1,754,218	$1,115,591	[2]$243,298	$7,809	$58,109	$51,040	$245,802	$32,569
Alabama	24,878	17,840	3,825	43	349	721	1,904	196
Alaska	16,560	11,822	229	0	207	484	3,000	818
Arizona	30,321	15,818	7,544	95	854	924	4,015	1,071
Arkansas	10,185	4,775	4,372	0	112	346	457	123
California	275,452	212,361	4,873	253	11,851	1,969	44,000	145
Colorado	56,204	43,557	4,614	431	2,066	4,391	652	493
Connecticut	16,381	7,618	182	47	532	94	7,481	427
Delaware	5,760	3,500	631	0	498	219	872	40
Florida	42,462	21,889	1,662	146	1,277	997	15,799	692
Georgia	42,268	16,928	15,792	406	463	1,877	6,279	523
Hawaii	26,859	16,136	9,907	130	363	65	55	203
Idaho	8,727	3,868	3,664	11	28	432	724	0
Illinois	53,119	34,650	4,435	560	1,209	762	10,452	1,051
Indiana	51,932	36,431	4,816	576	903	1,754	7,215	237
Iowa	32,073	20,103	4,594	147	309	919	5,393	608
Kansas	31,277	20,021	5,257	282	551	789	4,134	243
Kentucky	17,124	9,171	1,809	142	651	398	4,865	88
Louisiana	21,953	8,163	1,193	0	637	796	11,110	54
Maine	6,438	4,307	310	10	89	253	1,469	0
Maryland	27,717	18,797	5,876	4	948	1,538	487	67
Massachusetts	10,570	8,028	1,245	14	237	308	737	1
Michigan	111,946	70,965	9,224	388	6,265	6,381	16,176	2,547
Minnesota	53,701	30,923	4,990	0	3,102	1,269	11,215	2,202
Mississippi	19,023	9,029	4,626	380	662	720	3,492	114
Missouri	34,461	14,400	6,241	15	287	677	12,401	440
Montana	8,654	3,365	2,742	0	112	801	1,584	50
Nebraska	17,711	6,978	6,305	36	362	431	3,541	58
Nevada	6,449	3,560	1,292	42	140	439	922	54
New Hampshire	3,856	2,846	429	0	28	5	262	286
New Jersey	25,913	13,316	5,427	72	694	189	5,460	755
New Mexico	18,170	14,115	1,508	13	182	653	1,201	498
New York	51,006	37,287	1,278	496	2,127	1,781	4,287	3,750
North Carolina	53,762	34,169	13,480	138	2,181	1,546	1,508	740
North Dakota	6,701	2,541	2,857	0	85	272	91	855
Ohio	38,155	24,634	6,489	167	1,634	2,127	2,337	767
Oklahoma	19,633	11,012	5,219	0	189	328	1,824	1,061
Oregon	33,982	23,345	5,594	152	1,170	894	2,372	455
Pennsylvania	45,931	30,504	2,972	52	1,237	1,445	8,756	965
Rhode Island	8,855	7,466	522	100	160	50	520	37
South Carolina	10,975	4,862	4,830	12	590	396	173	112
South Dakota	6,711	2,902	2,552	38	63	200	598	358
Tennessee	12,356	10,086	485	76	246	552	531	380
Texas	111,121	60,186	27,285	140	6,212	4,820	9,096	3,382
Utah	33,306	26,054	2,151	1,108	823	849	2,087	234
Vermont	7,188	4,761	742	0	225	136	1,160	164
Virginia	34,331	21,192	6,789	63	1,306	1,218	2,859	904
Washington	69,321	52,237	10,037	335	1,170	1,365	2,593	1,584
West Virginia	6,960	4,844	1,633	0	48	128	67	240
Wisconsin	89,102	47,698	17,471	18	2,634	1,195	17,589	2,497
Wyoming	6,678	4,531	1,298	671	41	137	0	0

[1] Does not include $7.3 million in R&D expenditures of public universities and colleges in outlying areas (primarily Puerto Rico).

[2] Includes R&D funds to affiliated agricultural experiment stations, research centers, and medical schools, as well as funds from State government agencies for the performance of R&D work.

[3] Unrestricted funds from all sources except the Federal Government that State universities and colleges were free to spend for R&D purposes and that were so budgeted.

[4] Funds restricted to R&D by the source, e.g., a private individual or a professional society.

APPENDIX D
Reproduction of Survey Questionnaire

U.S. DEPARTMENT OF COMMERCE
Social and Economic Statistics Administration
BUREAU OF THE CENSUS
Washington, D.C. 20233

OFFICE OF THE DIRECTOR

Cover letter for State R&D
Agency Questionnaire

RD-2(L)

Dear Sir:

Your agency may perform or sponsor research and development work within the scope of the current survey of State government R&D activities that the Bureau of the Census is conducting for the National Science Foundation. A copy of the survey form is enclosed, and we are requesting that you read the instructions, noting carefully the types of activities included.

This survey, which is similar to one conducted for fiscal years 1967 and 1968, requests information on financing, personnel requirements, and program content of R&D activities of State government agencies, excluding State universities and colleges. The latter are covered in another National Science Foundation report.

If your activities are relevant to this survey, please provide the requested information on the addressed copy of the questionnaire and return it in the enclosed official envelope, which requires no postage. If your agency is not engaged in R&D projects, indicate this fact on the form and return it. The green copy is for your files.

Your cooperation is necessary to the success of this survey, and therefore your early response will be helpful and very much appreciated.

Sincerely,

Vincent P. Barabba

VINCENT P. BARABBA
Director
Bureau of the Census

Enclosures

O.M.B. No. 041-S73078; Approval expires June 30, 1975

INFORMATION SUPPLIED BY	FORM S-179 (10-8-73)	U.S. DEPARTMENT OF COMMERCE SOCIAL AND ECONOMIC STATISTICS ADMIN. BUREAU OF THE CENSUS
Name		**SURVEY OF STATE GOVERNMENT RESEARCH AND DEVELOPMENT**
Title		*(Please correct any error in name and address including ZIP code)*
Agency name		
Address *(Number and street, city, State, ZIP code)*		
Telephone *(Area code, number, extension)*		
RETURN TO ▶ Governments Division Bureau of the Census Washington, D.C. 20233		

DEFINITIONS AND REPORTING INSTRUCTIONS

Please read through this entire questionnaire before filling it out. Then, as promptly as possible, assemble and enter the requested information and return the original copy in the accompanying preaddressed return envelope. The file copy is for your records.

▶ **A. SURVEY COVERAGE** – This survey covers the research and development activities of State Governments **excluding** State governmental institutions of higher education and their affiliated organizations, such as research centers, agricultural experiment stations, etc. These are covered in other surveys.

1. DEFINITIONS OF RESEARCH AND DEVELOPMENT

The term "research and development (R and D) activities" as used in this survey covers:

a. Research – Systematic, intensive study directed toward fuller scientific knowledge or understanding of the subject studied. Research may be classified as either **basic** or **applied**. In **basic research** the investigator is concerned primarily with gaining a fuller knowledge or understanding of the subject under study. In **applied research** the investigator is primarily interested in a practical use of the knowledge or understanding for the purpose of meeting a recognized need.

b. Development – The systematic use of scientific knowledge directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes. It represents the application of the findings of research to meet practical problems.

c. R and D plant – Encompasses facilities and fixed equipment used in support of research and development. Included is the acquisition of, construction of, major repairs to, or alterations in structures, works, equipment, facilities, or land for use in the performance of research and development. Excluded are expendable equipment and miscellaneous items, such as office furniture and supplies.

2. EXCLUSIONS FROM RESEARCH AND DEVELOPMENT

a. Adoption of new techniques or products already brought to a usable condition – **example:** If one State agency performs research on polluted water and subsequently develops a new method of treating such water to make it potable, the activity would be classified as research and development. However, the adoption of this new method by another State agency would not be classified as research and development.

b. Collection of general purpose statistics – **example:** A State health department normally gathers and publishes, on a regular basis, statistics on the incidence of various diseases within the State. In itself, this activity is general-purpose data collection because the data gathering is not part of a research program and because the data are designed for use by a range of persons such as practicing physicians, public health officers, and school officials. If the data on incidence of disease were gathered as part of a project on the origin and nature of particular diseases, or to establish some generalization on why certain individuals or groups contact certain diseases, this would be research.

c. Miscellaneous Exclusions

(1) Training of scientific manpower
(2) Dissemination of scientific information
(3) Mapping
(4) Routine product testing
(5) Quality control

▶ **B. REPORTING INSTRUCTIONS** – Your report should cover all R and D work conducted directly or financed on a contractual or grant basis by your agency but should exclude any services you provided for R and D projects financed by other State government agencies, inasmuch as such R and D activity will be reported by the sponsoring State agencies themselves. R and D projects conducted by your agency which are partially or fully financed by Federal government agencies, local government agencies, or private organizations are to be included.

CONSOLIDATED PROJECTS

You may report as **a single activity** any series of projects where boxes 3 and 4 would be identically marked; that is, when the type of research and development work and the field of science of the projects are the same. However, when the type of research and development work and the field of science differ, report each project separately.

Following are instructions which apply to reporting for each project.

Item 1 – List the name of the subdivision of your agency involved in each R and D project reported.

Item 2 – Please enter a description, in nontechnical terms, of the project and its primary applications or objectives.

Item 3 – Check each project according to the type of R and D work involved (basic research, applied research, or development) as defined in 1a and b above. If the work involved more than one of these types, please report each as an individual project.

Item 4 – Check the field of science to which the project is applicable. **(Definitions of these fields are listed on page 3 of this form.)** If the project involved more than one field of science, please report each part separately. If this is not possible, please check the predominant field covered. In all cases, the field of science reported should be according to the nature of the project and not by the type of personnel involved.

Item 5 – Report current expenditures for each project, i.e., all expenditures (including related overhead cost.) other than those for R and D plant, which are to be reported at item 7. Current expenditures of your agency which apply to two or more projects should be allocated as accurately as possible among them. In the subsections of item 5, distribute expenditure amounts among the several categories provided, in terms of the type of government agency or other organization actually performing the R and D work. Please enter "None" or a dash for inapplicable items.

Item 6 – Determine the amount of total **current expenditures** for this R and D project (as shown at item 5d) financed from (a) **Federal government sources** (grants, reimbursements, cost-sharing arrangements, (b) **own State sources** (funds of your own agency) – **do not include** funds furnished by universities and colleges), or (c) **"other sources"** (grants, reimbursements, or cost-sharing amounts provided by foundations, business firms, universities and colleges, or other outside sources specifically for the project being reported). List the source amounts in the appropriate column for fiscal years 1972 and 1973. Please list "other sources" in the notes section on page 3. The amounts shown at 6a+b+c should add to the total shown at item 5d.

Item 7 – Report for each project the total expenditures for R and D plant and facilities including acquisition of land, structures and fixed equipment, and any construction, major repairs and alterations of plant used for R and D activities.

Item 8 – Determine the amount of total R and D plant expenditures (item 7) financed from Federal government sources, own State sources (funds of your own agency) or other sources and list under the appropriate columns for fiscal years 1972 and 1973. Definitions are the same as for item 6.

Item 9 – Report man-years (to the nearest tenth of a 12-month year) applied on the project by your **own** employees. **Note** that the expenditures reported at item 5a included personnel costs of all man-years reported at item 9. For employees who worked part-time or on more than one project, please allocate man-years applicable for each project (not number of employees). (For example, two employees, each working half a year (6 months) on an R and D project, would be considered to be the equivalent of 1.0 man-years.) Do not include data here on personnel involving expenditures reported at items 5b and 5c.

Scientists and engineers include persons engaged in scientific work, and having at least a bachelor's degree or equivalent work experience in the appropriate field.

Technicians include persons engaged in scientific or engineering work, and having the technical knowledge equivalent to at least two years of training in the appropriate field beyond the high school level.

Other personnel includes typists, clerks, administrative, and all other personnel allocable to the project.

Item 10 – Supplemental questions (10a–c) are being asked to amplify the scope and nature of your R and D activities.

Please report each project as fully as practicable, using estimates where necessary. If some items or subsections do not apply to a project enter "None" or a dash in the reporting space provided.

The "Notes" space, following the definitions of fields of science on page 3, may be used to explain any item that may be unclear, or to describe any other special facts about a reported project.

Please review your entries before signing and returning the original of the completed form in the accompanying envelope.

Item	R and D project or activity number ①	R and D project or activity number ②	R and D project or activity number ③	R and D project or activity number ④
1. Name of agency subdivision involved – See instruction B, item 1.				
2. Nature of project – Enter brief description. If additional space is needed, continue in "Notes" section. See instruction B, item 2.				
3. Type of research or development work – mark (X) one for each project. See instruction B, item 3.	☐ Basic research ☐ Applied research ☐ Development	☐ Basic research ☐ Applied research ☐ Development	☐ Basic research ☐ Applied research ☐ Development	☐ Basic research ☐ Applied research ☐ Development
4. Field of science – mark (X) one for each project. See instruction B, item 4.	☐ Biological ☐ Clinical medical ☐ Psychology ☐ Physical Sciences ☐ Environmental Sciences ☐ Mathematics ☐ Engineering ☐ Social Sciences ☐ Other Sciences – Specify ▼	☐ Biological ☐ Clinical medical ☐ Psychology ☐ Physical Sciences ☐ Environmental Sciences ☐ Mathematics ☐ Engineering ☐ Social Sciences ☐ Other Sciences – Specify ▼	☐ Biological ☐ Clinical medical ☐ Psychology ☐ Physical Sciences ☐ Environmental Sciences ☐ Mathematics ☐ Engineering ☐ Social Sciences ☐ Other Sciences – Specify ▼	☐ Biological ☐ Clinical medical ☐ Psychology ☐ Physical Sciences ☐ Environmental Sciences ☐ Mathematics ☐ Engineering ☐ Social Sciences ☐ Other Sciences – Specify ▼
5. Current R and D expenditures (excluding R and D plant) from all sources – See instruction B, item 5.	Fiscal year 1972 / Fiscal year 1973	Fiscal year 1972 / Fiscal year 1973	Fiscal year 1972 / Fiscal year 1973	Fiscal year 1972 / Fiscal year 1973
a. All R and D work performed by this agency except where funds expended are provided by other agencies of this state.				
b. Grants or reimbursements to universities and colleges (public and private), and their affiliated hospitals, agricultural experiment stations, or research centers				
(1) State universities and colleges				
(2) Local public universities and colleges				
(3) Private universities and colleges				
c. Other R and D work contracted out to				
(1) Private individuals or firms				
(2) Private nonprofit organizations				
(3) Other agencies of this State				
(4) Other governmental agencies including Federal, local, agencies of other States, or multigovernmental agencies				
d. Total current R and D expenditures (a+b+c) →				
6. Total current R and D expenditures as reported at item 5d above financed from: See instruction B, item 6.				
a. Federal government sources – Describe in detail in item 10a.				
b. Own State sources				
c. Other sources – Explain in "Notes" section on reverse.				
7. Expenditures for R and D plant – See instruction B, item 7.				
8. Total R and D plant expenditures (item 7) financed from: See instruction B, item 8.				
a. Federal government sources – Describe in detail in item 10a.				
b. Own State sources				
c. Other sources – Explain in "Notes" section on reverse.				
9. Man-years of R and D employment in this government (or agency) – See instruction B, item 9.				
a. Scientists and engineers				
b. Technicians				
c. Other personnel				
d. Total (a+b+c) →				

10a. List to the right each supporting Federal agency and the amount of funds provided by each that are included under items 5a and 6a. Also cite the Federal project or grant number and the enabling legislation (the Act of Congress) under which the reported funds have been authorized.

R and D project or activity	Name of agency 1972	Name of agency 1973	Amount (Dollars) Fiscal year 1972	Amount (Dollars) Fiscal year 1973	Federal agency project grant No. Fiscal year 1972	Federal agency project grant No. Fiscal year 1973	Public law and section Fiscal year 1972	Public law and section Fiscal year 1973
①								
②								
③								
④								

10b. For each project currently being financed by other your own State sources or other non-Federal sources (items 6b and 6c) indicate, to the right, if they were previously financed in whole or in part by Federal grants or contracts.

Project – mark (X) ①	②	③	④
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

10c. Please list the specific problem areas where you feel significant expansion in Federally funded research and development would be of value to your agency. (Continue in "Notes" section on page 3 if necessary.)

▶ **NOTE** – Please augment the descriptions of your current projects (requested in item 2 of the questionnaire) by furnishing, if readily available, publications and other written material that will amplify the nature of the undertaking.

DEFINITIONS OF FIELDS OF SCIENCE

1. **Biological sciences** are those which, apart from the clinical medical sciences as defined below, deal with the origin, development, structure, function, and interaction of living things. The agricultural and basic medical sciences are included. Examples of biological sciences are:

   anatomy; animal sciences; bacteriology; biochemistry; biogeography; biological oceanography; biophysics; ecology; embryology; entomology; evolutionary biology; genetics; immunology; microbiology; nutrition and metabolism; parasitology; pathology; pharmacology; physical anthropology; physiology; plant sciences; radiobiology; systematics.

2. **Clinical medical sciences** are concerned with the use of scientific knowledge for the identification, treatment, and cure of disease. Examples of clinical medical sciences are:

   internal medicine; neurology; ophthalmology; preventive medicine and public health; psychiatry; radiology; surgery; veterinary medicine; dentistry; physical medicine and rehabilitation; pharmacy; podiatry.

3. **Psychology** deals with behavior, mental processes and individual and group characteristics and abilities. Examples of psychological sciences are:

   experimental psychology, animal behavior, clinical psychology; comparative psychology, ethnology; social psychology, educational, personnel, vocational psychology and testing; industrial and engineering psychology; development and personality.

4. **Physical sciences** are concerned with the understanding of the material universe and its phenomena. They comprise the fields of astronomy, chemistry, and physics.

5. **Environmental sciences** (Terrestrial and extraterrestrial) are concerned with the gross non-biological properties of the areas of the solar system which directly or indirectly affect man's survival and welfare; they comprise the fields of atmospheric sciences, geological sciences, and oceanography. Obligations for oceanography are confined to studies supporting physical oceanography. Studies pertaining to life in the sea, or other bodies of water, are to be reported as support of biology.

6. **Mathematics** employs logical reasoning with the aid of symbols and is concerned with the development of methods of operation employing such symbols. Examples of mathematical disciplines are:

   algebra; analysis; applied mathematics; computer science; foundations and logic; geometry; numerical analysis; statistics; topology.

7. **Engineering** is concerned with studies directed toward developing engineering principles or toward making specific principles usable in engineering practice. Engineering is divided into seven fields: aeronautical, chemical, civil, electrical, mechanical, metallurgy and materials.

8. **Social sciences** are directed toward an understanding of the behavior of social institutions and groups and of individuals as members of a group. These include anthropology, economics, history, linguistics, political science, sociology, etc.

9. **Other sciences** not elsewhere classified. To be used for multidisciplinary and interdisciplinary projects that cannot be classified within one of the above broad fields of science.

NOTES – List here any "other sources" of R and D funds reported at items 6c or 8c.

OTHER NOTES OR COMMENTS *(Please indicate item number and letter to which explanation applies)*

APPENDIX E
Selected Bibliography

Alesch, Daniel J. *A Strategy for Developing in State Government the Capability to Change Through Science and Technology*. A report prepared under NSF Grant No. GI-44. Santa Monica, Calif.: The Rand Corporation, June 1971.

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Other Science Resources Publications

REPORTS	NSF No.	Price
Work Activities of Employed Doctoral Scientists and Engineers in the U.S. Labor Force, July 1973	75-310	In press
Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1973	75-304	In press
Young and Senior Science and Engineering Faculty, 1974: Support, Research Participation, and Tenure	75-302	In press
Projections of Science and Engineering Doctorate Supply and Utilization, 1980 and 1985	75-301	$1.30
Detailed Statistical Tables, Manpower Resources for Scientific Activities at Universities and Colleges, January 1974	75-300-A	—
Detailed Statistical Tables, Graduate Science Education: Student Support and Postdoctorals, Fall 1973	74-318-A	—
Reviews of Data on Science Resources, No. 22, "The Federal Role in the Support of Graduate Science and Engineering Education"	74-317	$0.25
An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1975	74-313	$2.25
Research and Development in Industry, 1972	74-312	$2.05
Immigrant Scientists and Engineers in the United States: A Study of Characteristics and Attitudes	73-302	$2.50
A Price Index for Deflation of Academic R&D Expenditures	72-310	$0.25
Unemployment Rates and Employment Characteristics for Scientists and Engineers, 1971	72-307	$1.75
Papers and Proceedings of a Colloquium on Research and Development and Economic Growth/ Productivity	72-303	$0.50
Scientific Human Resources: Profiles and Issues	72-304	$0.25

HIGHLIGHTS		
"Separately Budgeted Academic R&D Expenditures Decline in Real Terms in FY 1974"	75-306	—
"The 1972 Scientific and Engineering Population Redefined"	75-305	—
"20-Percent Increase in Energy Activity Paces Industrial R&D Spending in 1973"	74-319	—
"R&D Expenditures of Independent Nonprofit Institutions Approach $1 Billion in 1973"	74-309	—
"Immigration of Scientists and Engineers Drops Sharply in FY 1973, Physician Inflow Still Near FY 1972 Peak"	74-302	—
"Selected Characteristics of Five Engineering and Scientific Occupational Groups, 1972"	73-306	—
"NSF Forecasts Rise in Company-Funded Research and Development and R&D Employment"	73-301	—
"Total Scientific and Technical Personnel in Industry Remains Level, R&D Personnel Lower in 1970"	72-306	—